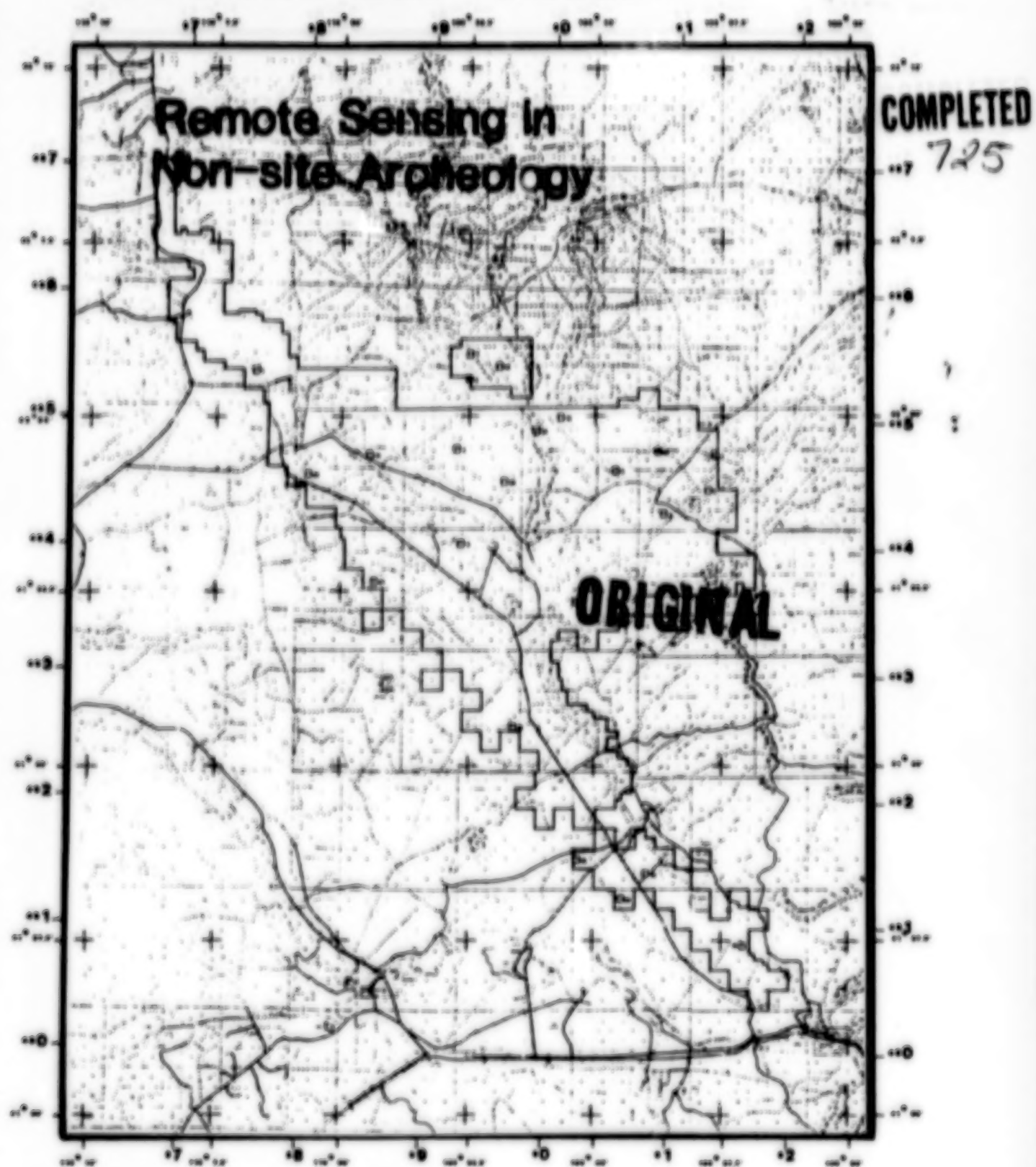


THE SEEDSKADEE PROJECT



Edited by DWIGHT L. DRAGER
and ARTHUR K. IRELAND

THE SEEDSKADEE PROJECT:

Remote Sensing in Non-site Archeology

**Edited by DWIGHT L. DRAGER
and ARTHUR K. IRELAND**

The investigations covered by this report were funded by the Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah, under Interagency Agreement No. 2-07-40-83351

**UNITED STATES
DEPARTMENT OF THE INTERIOR
National Park Service
Southwest Region
Southwest Cultural Resources Center
Division of Cultural Research
Branch of Remote Sensing
Albuquerque, New Mexico
and
Bureau of Reclamation
Upper Colorado Region
Salt Lake City, Utah
1986**



BEST COPY AVAILABLE

ACKNOWLEDGEMENTS

We, the editors and authors of this volume, wish to thank the many people without whose help this report would not have been possible. Especially important to this project were Wayne A. Prokopetz, Regional Archeologist, Upper Colorado Regional Office, Bureau of Reclamation, who asked us to participate in this endeavor, and the Bureau of Reclamation itself, which funded the project. Also notable were W. James Judge, former chief of the Branch of Cultural Research, Southwest Cultural Resources Center, National Park Service, and Larry V. Nordby, current chief of that branch. Both have provided advice and moral support when it was needed. Deepest thanks are due to James I. Ebert, at the time in charge of the research and development aspects of the Branch of Remote Sensing, Southwest Cultural Resources Center, National Park Service, and the person who spent the summer in the Seedskadee area overseeing the project, for it was his theoretical orientation, and that of the project field directors, which sent the project in the profitable direction it went. Special thanks also go to Signa Larralde and LuAnn Wandsnider, who directed the field operations of the project and provided us with excellent reports and data. We also want to thank Chambers Consultants and Planners Albuquerque Division for providing the excellent staff for the field operations in the Seedskadee area. We certainly must thank the field crew members: Tom Peebles, Anne Hummer, Sylvia Miller, Ethan Gell, Bill McMillan, Colin Garvey, Karen Kramer, Barbara Cox, and Doug Mau, for it was they, along with Jim, Signa, and LuAnn, who suffered through the heat, storms, flies, and mosquitoes during the project. Last, but certainly not least, we thank Rosarita Archuleta and Toni Curran, who typed the initial and final drafts of this volume.

CONTRIBUTORS

Dwight L. Drager
James I. Ebert
Arthur K. Ireland
Signa Larralde
LuAnn Wandsnider

TABLE OF CONTENTS

Acknowledgements	ii
List of Tables	v
List of Illustrations	vii
A Project and Its Beginnings by Dwight L. Drager	1
Proposal for Remote Sensing and Class I Survey by James I. Ebert	3
Interagency Agreement 2-07-40-83351 Class I Cultural Resources Survey of Seedskadee Project	17
Modeling Climatic and Landform Factors Affecting the Character of the Archeological Record in Arid Lands: A Remote Sensing Approach in Southwestern Wyoming by LuAnn Wandsnider and James I. Ebert	23
Environmental and Background Information by Arthur K. Ireland and Dwight L. Drager	49
A Culture History of the Seedskadee Project Area by Arthur K. Ireland	55
National Register Sites Found in the Seedskadee Project Area by Dwight L. Drager	135
Seedskadee Cultural Resources Assessment Project: Report to the Branch of Remote Sensing, National Park Service by LuAnn Wandsnider and Signa Larralde	151
Accuracy in Archeological Surface Survey in the Seedskadee Project Area, Southwestern Wyoming by LuAnn Wandsnider and James I. Ebert	211
Distributional Archeology: Survey, Mapping, and Analysis of Surface Archeological Materials in the Green River Basin, Wyoming by James I. Ebert, Signa Larralde, and LuAnn Wandsnider	227
Quality Control in Lithic Analysis: A Test of Precision by Signa Larralde	243
A Model of Possible Site Concentrations in the Seedskadee Project Area by Dwight L. Drager	255
Conclusions and Recommendations by Dwight L. Drager	271
Bibliography and References, Compiled by Arthur K. Ireland and James I. Ebert	273
Appendix I Daily Log Summary	343
Appendix II Discovery Information	349

Appendix III Grid Descriptions	375
Appendix IV Field Forms	423
Appendix V Field Form Codes	431
Appendix VI Feature Forms	437
Appendix VII Photo Logs	521
Appendix VIII Catalog of Collected Artifacts	525
Appendix IX University of New Mexico Computer Analysis Programs	529
Appendix X Statistical Analysis System (SAS) Programs	541
Appendix XI SAS Analysis of Sample Unit 17	551
Appendix XII SAS Cluster Analysis of Sample Unit 17	563
Appendix XIII Diagnostic Projectile Point Types	583
Appendix XIV 1983 Field Survey Sample Unit Locations	608
Appendix XV Previous Archeological Clearance Surveys in the Seedsakadee Area	613
Appendix XVI Sample Unit Artifact Distribution Maps	617

LIST OF TABLES

Table.	Page
4-1. Geomorphological Zones	32
4-2. Energy Regimes	42
6-1. Proposed cultural chronologies for the Inter-mountain/ Plateau region	99
6-2. Inter-mountain/Plateau Chronologies	101
6-3. Euro-American/Native American Confrontations, 1850-1890	122
6-4. Reporting Variables used by Survey Institutions in the Seedskadee Regional Study Area	127
6-5. Site Type Summaries for the Seedskadee Regional Study Area	128
6-6. Diagnostic Lithic Artifacts Found during the 1983 Seedskadee Project Survey	133
8-1. Seedskadee Cultural Resources Assessment Project Field Data	169
8-2. Cluster Description	174
8-3. Percent of Artifacts Found and Not Found by Attributes	176
8-4. Percent of Artifact Recovery by Crew	179
8-5. Continuous Variable Results-Analysis of Variance Tukey Means Test	182
8-6. Ratios of High to Low Coder Disagreements on Continuous and Ordinal Variables	184
8-7. Percent Disagreement in Coding of Ordinal Variables	184
8-8. Percent Disagreement in Coding of Discrete Variables	185
8-9. Frequency and Percentage of Collapsed Types in Assemblages	185
8-10. Frequency of Artifacts per Sweep by Time of Discovery	188
8-11. Discovery Context as Shown by Flag Color	190
8-12. Summary of Whole Flake Attribute Clustering for Unit 17	199
8-13. Summary of Spatial Cluster Characteristics for Unit 17	201
9-1. Cluster Descriptions	218
9-2. Percent of Artifacts Found and Not Found by Attribute	222

9-3.	Percent Artifact Recovery by Crew	222
11-1.	Variables Coded	249
11-2.	Analysis of Variance Tukey Means Test	250
11-3.	Ratios of High to Low Coder Disagreements on Continuous and Ordinal Variables	250
11-4.	Percentage Disagreement in Coding Ordinal Variables	251
11-5.	Percentage Disagreement in Coding Discrete Variables	251
11-6.	Frequency and Percentage of Collapsed Types in Assemblages	252
11-7.	Noncontinuous Variables Ranked in Order of Precision: Most to Least	252
12-1.	Archeological Concentrations (Sites per Hectare) by Environmental Zone	261
12-2.	Artifact Concentration Statistics by Geomorphic Zone	265
12-3.	Sample Units by Artifact Density	266
12-4.	Mann-Whitney Test of Significance of Artifact Density Distribution by Geomorphic Zones	268
12-5.	Geomorphological Zone Ranking by Archeological Concentration	269

LIST OF ILLUSTRATIONS

Figure

4-1. The Study Area in the Green River Basin of Southwestern Wyoming	26
4-2. Study Area Within Which On-the-ground Survey Will Be Conducted to Test Conclusions Generated on the Basis of Remote Sensor and Other Environmental Data	28
4-3. Seedskadee Cultural Resources Assessment Project: Geomorphological Zones	30
4-4. Model of Disjunction Between the Transportation vs. Deposition of Archeological Artifacts and Their Matrix of Lighter Sediments	38
5-1. Index Sheet of USGS 7.5-Minute Quadrangle Maps of the Seedskadee Cultural Resources Assessment Area	51
5-2. Seedskadee Project Area Boundaries and Survey Block Locations	52
5-3. Seedskadee Project Area Boundaries and Survey Block Locations: Geology Map	53
5-4. Seedskadee Project Area Boundaries and Survey Block Locations: Soils Map	54
6-1. Plains Sites	56
6-2. Folsom Preform, 1983 Seedskadee Project Survey	58
6-3. Plainview Point, 1983 Seedskadee Project Survey	60
6-4. Cody Knife, 1983 Seedskadee Project Survey	60
6-5. Lanceolate I Point, 1983 Seedskadee Project Survey	63
6-6. Lanceolate II Points, 1983 Seedskadee Project Survey	63
6-7. McKean Lanceolate Point, 1983 Seedskadee Project Survey	65
6-8. Mallory Side-notched Points, 1983 Seedskadee Project Survey	66
6-9. Yankee Point, 1983 Seedskadee Project Survey	67
6-10. Late Plains Archaic Corner-notched Points, 1983 Seedskadee Project Survey	68
6-11. Avonlea Point, 1983 Seedskadee Project Survey	68
6-12. Plains Side-notched Point--Washita Triangular Variety, 1983 Seedskadee Project Survey	71

6-13. Plains Side-notched Points--Buffalo Gap Single-spur Variety, 1983 Seedskadee Project Survey	71
6-14. Plains Side-notched Point--Emigrant Basal-notched Variety, 1983 Seedskadee Project Survey	71
6-15. Late Prehistoric Corner-notched Points, 1983 Seedskadee Project Survey	72
6-16. Late Prehistoric Triangular Points, 1983 Seedskadee Project Survey	73
6-17. Great Basin sites	76
6-18. Eastgate Split-stem Point, 1983 Seedskadee Project Survey	85
6-19. Fremont Sites and Sub-areas in Utah	87
6-20. Physiographic Provinces of the Inter-mountain/Plateau Region	91
6-21. Inter-mountain/Plateau Sites	94
6-22. Folsom Point Found Across the Columbia River from the Dalles, Oregon	97
6-23. Historic Trails and Railroads	117
6-24. Military Forts and Camps in Wyoming in the Late 1800s	120
6-25. Historic Site Occupations in the Seedskadee Regional Study Area by Decades	129
6-26. Locations of Sites on, Nominated to, or Recommended for Nomination to the National Register of Historic Places	131
7-1. Seedskadee Project Area Boundaries and Survey Block Locations: Historic Trails	136
8-1. Unit 24 Seeded Artifacts	175
8-2. Cluster Density vs. Percent of Artifacts Recovered	177
8-3. Cluster Density vs. Percent of Artifacts Recovered by Crew	180
8-4. Histogram of Size Index for Whole Flakes from Unit 17	196
8-5. Histogram of Thinness Index for Whole Flakes from Unit 17	197
8-6. Map of Assemblages in Unit 17	200
9-1. Cluster Density	219
9-2. Cluster Density	220

9-3. Unit 24 Seeded Artifacts	223
12-1. Geologic Zones Map	257
12-2. Soil Zones Map	258
12-3. Geomorphological Zones Map	259
12-4. Predicted Archeological Site Concentrations Map	260
12-5. Histograms of Top and Bottom Halves of Ranked Geomorphological Zones Showing the Difference in Zone Distribution	267

A PROJECT AND ITS BEGINNINGS

by

Dwight L. Drager

In the early years of the 1980s, there developed a concerted policy by many landholding agencies of the federal government, particularly within the Department of the Interior under James Watt, to open for public sale federal lands which were determined to be of more value to the country in private than public ownership.

Section 106 of Public Law 89-655, the National Historic Preservation Act of 1966, requires federal agencies to take into account the effect of proposed undertakings on properties listed in or eligible for inclusion in the National Register of Historic Places. Executive Order 11593 requires federal agencies to survey, inventory, and nominate all historic resources under their jurisdiction to the National Register. Agency heads must assure that potentially qualified federal property is not inadvertently transferred, sold, demolished, or substantially altered without taking such precautions.

One area that the Bureau of Reclamation determined should be opened for public sale surrounded the Seedsakdee National Wildlife Refuge in southwestern Wyoming. Seedsakdee straddles the Green River north of Rock Springs as it drains the Green River Basin south to the Colorado River. The Green River Basin lies between the high plains of eastern Wyoming and the Great Basin of Utah and Idaho. Its vegetation and soils are those associated with highland arid regions, short grasses and sandy soils. It has basically a cool, xeric climate.

Prehistorically, the area is known to have harbored cultures reaching back to the late Pleistocene. The type site for the Paleo-Indian Eden culture lies less than fifty air miles from the Seedsakdee area. Historically, the Oregon Trail is known to have passed through this region. Little else was known by the Bureau of Reclamation prior to embarking on a project to prepare the area for sale.

Because of previous projects which had been carried out by the Branch of Remote Sensing of the Southwest Cultural Resources Center of the National Park Service such as the National Petroleum Reserve in Alaska (Ebert et al. 1980), Shenandoah National Park (Ebert and Gutierrez 1979), the Navajo Indian Irrigation Project (Drager and Ireland 1983) and the San Juan Basin of New Mexico (Drager 1983), the Bureau of Reclamation asked the Branch if they would be interested in assisting in the development of a program to help plan the inventory survey of the lands near the Seedsakdee National Wildlife Refuge. The Branch saw this as an opportunity to examine a number of ideas about non-site archeological survey data collection which were becoming prevalent in archeology as well as an applications project to test a new predictive modeling approach which the Branch had just developed.

The Branch submitted a proposal to the Bureau of Reclamation describing how they would like to see the project carried out. With minor adjustments, a memorandum of agreement was signed between the National Park Service and the

Bureau of Reclamation to allow the Branch of Remote Sensing to undertake a Class I literature search and a small Class II sample survey to determine what archeological materials were known to exist within and around the Seedskadee National Wildlife Refuge and whether any consistent relationships could be established which might aid in the planning of the survey of the entire project area.

The following reports discuss the Branch of Remote Sensing's work in conducting the two-pronged research project. All relevant aspects of the project, from the Branch's proposal and memorandum of agreement to the final maps and recommendations are included as are extensive appendices and the site files of the surveyed sample units. It is hoped that all this material will be of value to other researchers and managers faced with similar problems. If the methods we used to help the Bureau of Reclamation solve their problem can be of use to you, then this project has more than met the original goals for which it was designed.

REFERENCES

Drager, Dwight L.

- 1983 "Projecting Archeological Site Concentrations in the San Juan Basin, New Mexico" in Dwight L. Drager and Thomas R. Lyons, eds., Remote Sensing in Cultural Resource Management: The San Juan Basin Project. Albuquerque, NM: Branch of Remote Sensing, National Park Service.

Drager, Dwight L., and Arthur K. Ireland

- 1983 "Projecting Archeological Site Occurrences on the Navajo Indian Irrigation Project" in Dwight L. Drager and Thomas R. Lyons, eds., Remote Sensing in Cultural Resource Management: The San Juan Basin Project. Albuquerque, NM: Branch of Remote Sensing, National Park Service.

Ebert, James I., and Alberto A. Gutierrez

- 1979 "Relationships Between Landscape and Archaeological Sites in Shenandoah National Park: A Remote Sensing Approach." APT (Bulletin of the Association for Preservation Technology), XI(4):69-87.

Ebert, James I., with contributions by Galen N. Brown, Dwight L. Drager, Dick Ping Hsu, and Thomas R. Lyons

- 1980 "Remote Sensing in Large-scale Cultural Resources Survey: A Case Study from the Arctic" in Thomas R. Lyons and Frances Joan Mathien, eds., Cultural Resources Remote Sensing. Washington, DC: Division of Cultural Resources Management, National Park Service.

SEEDSKADEE PROJECT

**Proposal for Remote Sensing
and
Class I Survey**

**Compiled and Written by
James I. Ebert**

**Branch of Remote Sensing
Division of Cultural Research
Southwest Cultural Resources Center
National Park Service**

INTRODUCTION

This proposal is in response to a Request for Proposals received from the Bureau of Reclamation and titled "Draft Work Statement for the Performance of a Class I and Cultural Resource Survey of Seedskadee Project, Sweetwater County, Wyoming."

The project area includes some 185,000 acres of land along the banks of the Green River below the Fontenelle Dam in southwestern Wyoming. The Statement of Work calls for 1) a Class I Cultural Resources Survey and Remote Sensing Survey to assess the general nature of the resources, 2) the preparation of a predictive study design based on available information, and 3) a ground truth survey on a small sample of the project area.

This proposal discusses the methods that the Branch of Remote Sensing of the Division of Cultural Research of the Southwest Cultural Resources Center of the National Park Service proposes to follow to comply with the requirements in the above referenced Request for Proposals. The methods can be divided into three separate types. The Branch will conduct two out-of-house subcontracts and several in-house studies.

The in-house studies will consist of sampling the literature of Class I surveys to determine appropriate style, format, and content of such surveys. The Branch will simultaneously collect all remote sensing and other supportive data, will compile base maps of the project area, will analyze and interpret all remote sensing and known archeological data, will select and specify a first stage sample, and finally will analyze and compile the results of the first stage sample.

The out-of-house subcontracts will consist of one for the actual Class I literature search of the project area and one for the first stage field survey of the sample areas. Both of these portions of the project can best be performed in proximity to the project area, and in the second case, it must be.

The Branch wishes to emphasize that its activities are designed to sample the project area in order to prepare for conducting a full survey of the project area. In no way is the study discussed in this proposal to be expected to determine all cultural resources within the project area, nor should this study be considered as mitigation for those resources discovered. Rather, this study should give land managers information which will be useful in the preparation of a study to meet those goals.

1) Review Class I Literature Search/Survey Done for Wyoming and Other Relevant Areas

The first stage in the proposed project will be to collect, examine and review all available previously-conducted Class I literature searches/surveys conducted in the general project area and in the Wyoming area to determine the criteria for conducting and completing or reporting on such an activity. If an insufficient sample of Class I searches/surveys for the immediate project area or for Wyoming are available, other relevant Class I projects and documents will be reviewed. In addition, federal and other policies and guidelines pertaining to conducting and reporting on Class I surveys will be collected and examined, as will all known examples of Class I surveys which incorporate remote sensing methods in any manner. Other appropriate sources of information on current or special requirements for Class I surveys, such as the Wyoming SHPO's office, will be contacted during this phase of the project as well.

2) Initiate Class I Survey for Project Area

The Class I survey/literature search for the Project area will be initiated through research directed toward the location and copying of past survey reports and additional sources of survey data, if any, for the specific project area. In addition, cultural resources data for areas judged to be representative of or to have a bearing on the project area will also be sought, including areas adjacent to the project area as well as similar areas throughout Wyoming and the northern Plains in general. The input of the SHPO and other appropriate persons with experience in the archeology of the area will be requested to insure representativeness. A data-collection format will be arrived at, site-recording forms or other media produced, and a researcher will travel to the sources of recordable cultural resources data to insure complete and conscientious data collection and recording.

A summary will also be made of the general literature, and of widespread survey and other cultural resources data, recorded in adjacent or other appropriate areas of the Great Basin and the Northwestern Plains, which may have a bearing on the nature of the archeological record in the project area itself. In addition, any and all available data on historic or prehistoric cultural resources, landmarks, sites, etc., identified in areas not covered by organized survey will be collected and collated with the data collected during the other activities outlined above.

An important class of information that will be incorporated in this study, which is often disregarded in general at all levels of cultural resources survey and research, will be information on the ways that surveys were carried out in the past. Much of the result of cultural resources survey is probably due to differences in the ways in which surveys are carried out--goals, objectives, personnel and training, physical conditions of the survey area, weather, "intensity" of survey, and many other parameters which archeologists do not often think consciously about or record in any sort of rigorous manner. An attempt will be made, during the collection of survey data pertaining to the actual cultural resources found in the course of past surveys, to arrive at some sort of idea of the ways that surveys were undertaken in the past, and the conditions prevailing during these surveys. This will be done by contacting survey supervisory personnel wherever

possible, and by attempting to determine conditions at the times and places of each survey. This information will be compared with the results of the sample survey discussed in sections of this proposal appearing below; the sample survey will include careful control and recording of a wide range of the specific conditions of survey in this project.

3) Remote Sensing and Other Supportive Data Search and Collection

A thorough search will be conducted, concurrently with cultural resources data search and recording, for all extant and available sources of aerial photographs, space-platform remote sensor data, and other remote sensing information for the project area, and for other areas that are to be compared with the project area in terms of cultural resources found there. This will include a range of differently-defined areas, studied at different resolutions and scales. For instance, a careful aerial photographic interpretation of landform and other correlates of the occurrence of specific types of cultural sites may be carried out in and immediately adjacent to the project area itself; digital classification using space-platform (primarily Landsat) data will be undertaken and used for the basis of comparison of cultural resources in the project area with a larger region surrounding it. A comparison of the general character of cultural resources in the study area with those of the Great Basin and Northwestern Plains will be facilitated by the characterization of these larger regions by the use of visual interpretation of Landsat and other remote sensor data.

All appropriate federal, state, and local offices and agencies that hold or are likely to hold aerial photographs or other pertinent remote sensor imagery will be contacted, and listings of the data they maintain will be collected. The properties of these data will then be reviewed in light of past experience at the Branch of Remote Sensing by consultation with those familiar with the imagery or other data, and possibly through inspection visits to view and analyze samples of available imagery. From this information, a determination will be made of which extant remote sensor data will be useful and cost-effective if applied to the project at hand. Those data determined to be necessary will be acquired in the most useful form(s).

In addition to remote sensor data, much information on the natural resources and properties of nearly any area is always available in the form of geologic and geomorphologic maps, hydrologic information, vegetation maps and studies, climate and weather data, topographic and other physical landform maps, and many other similar sources. Some of these sources have been compiled using remote sensor data in the past; it is therefore unnecessary to reinterpret such imagery, and maps and other previously-collected information are particularly economical to use. They can serve as "primary" data, used in predictions and projections of correlations between cultural resource occurrences and natural factors and indications; or they can be employed as a form of verification or "ground truth checking" of interpretations and measurements made using remote sensor data. In any case, information gathered directly from existing remote sensor data and from other supportive data are combined to form a geographic data base with which to compare cultural resources, their occurrence in space, and their differential characteristics.

During the collection of both raw extant remote sensor data and previously-compiled supportive data sources, consideration will be given to recording

formats and methods by which these data can be usefully and appropriately combined into a geographic information system to be employed in later stages of this project. Such methods may be manual (forms, etc.) or digital, using computer facilities available at the Branch of Remote Sensing and at the Southwest Regional Office of the National Park Service.

4) Compile Useful Base Maps for All Stages of Project

An indispensable aid in any project which involves the integration of any data with a spatial component is the right kind of base map. Base maps can be physical, manipulable maps printed on paper or some other medium, or they can be digitally created to be used in conjunction with a computer geographic information system; in fact, a combination of these will be used in the project at hand.

Base maps are used as the framework within which to record the spatial component of data pertaining to both cultural resources and natural resources and conditions. Such a framework allows comparisons to be made between those properties of the resources in question which vary spatially, the goal and focus of nearly all aspects of cultural resources study and treatment. A less obvious fact is that the adequacy of base maps and other spatial frameworks for any problem at hand-- their accuracy, precision, resolution, and many other properties which directly affect answers to that problem--vary directly with their form, scale, and level of generalization. It is immediately apparent that a number of base maps, rather than a single base map form, may be necessary in any cultural resources project such as that proposed here.

Base maps are not always easy to compile, for source information is at times difficult to find and must be modified before use. USGS topographic maps at large scales are quite accurate, but often unwieldy to use for certain purposes requiring smaller-scale maps. Topographic data contained on small-scale maps that are commonly available may be insufficient, or may obscure a map to the extent that supplementary information cannot be added at a later time. Computer maps must be designed in such a way that they are compatible with maps to be used in the laboratory or field. Finally, map sheets of different sizes, and of different materials, (paper vs. film, etc.) may be required for various indoor and outdoor base map uses. All available maps of any form for the study area and region will be located, and copies acquired, prior to the determination of the optimum base map forms and formats at the Branch of Remote Sensing. Appropriate base maps and other recording frameworks will be compiled using these data and, if necessary, newly-drafted or compiled cartographic forms.

5) Remote Sensing Analysis and Interpretations

A number of analyses and interpretations of available remote sensor data for the project area and other areas judged relevant to the proposed research will be made at the Branch of Remote Sensing laboratory in Albuquerque. The first stage in these interpretations, already mentioned in section three above, is the review of all available aerial photographs, space imagery and other remote sensor data to determine its usefulness; in addition, a determination will be made, for each imagery type, of its appropriate application throughout different stages of the project.

Next, all available and appropriate aerial photographs will be examined for possible obvious site-detection signatures. Site detection signatures are arrays of visually-interpreted or measurable photographic properties that reveal the presence of cultural resources or materials; this may be because the actual "site" (structures, features, etc.) is seen in aerial photographs or, more frequently, because visible physical phenomena which can be seen in the photos correlate with locations in which cultural sites and materials are most likely to be found. The first step in determining possible site-location signatures is to inspect areas where sites are known to exist, and this requires the precise transfer of site locations to the aerial photographs to be used in interpretation. Transferring known site locations to aerial photographs of areas to be surveyed in future stages of this project will also aid field crews in recognizing previously-found sites. After site locations are marked on the aerial photographs, these will be carefully examined at variable magnifications using mirror and roll-film stereoscopes at the Branch's laboratory. Two specific approaches to recognizing and "predicting" site locations will be pursued in this stage of analysis: attempts to see actual archeological or historical materials and their indications, and the correlation of environmental variables with site locations. The first of these procedures is a classical tool of "aerial archeology", and has been used with success by archeologists for as long as remote sensing has been part of this science's repertoire (at least half a century). The immediate area of known occurrences of archeological and other cultural sites and materials is carefully inspected at high magnification, and in stereo, and possible indications of the extent of the site or materials is sought in the form of soil coloration differences, differential vegetative growth, or anything else that might be thought of as a "signature" for the site. Following the compilation of site signature in explicit, written form, the same or other photointerpreters can inspect all of the aerial photographs of an area to determine if any other, similar site signatures appear where sites are not known to exist. Although archeological sites are found this way, in many cases (particularly where lithic or other types of sites with no structures are concerned) cultural resource locations cannot strictly be "seen" in aerial photos of any but the very largest scales.

Another, somewhat similar approach to "predicting" areas of site occurrence involves seeing not only the marks of actual materials patterning in sites, but in analyzing the occurrence of physical environmental indications--things such as landform, geological and vegetative differences, the occurrence of water, and other resource patterning--as it varies from areas where sites are found to areas where they have not been found by surveyors. Obviously, this is a "one way" method of predicting where sites can be found, for it depends solely on the possibilities of site presence and not necessarily site absence. This technique, which was experimented with by the Branch of Remote Sensing at Shenandoah National Park (Ebert and Gutierrez 1979, 1980), is useful for identifying areas where large concentrations of cultural sites--or sites of a specific character--are expected within an overall study area. These may be places which were for some reason "preferred" locations by past peoples, who placed their sites there, or they may be places where cultural sites in general, or cultural sites of a specific sort, have been preserved or are otherwise visible to the archeologist in the field. In fact, during the course of a predictive survey of this nature, it is possible to introduce controls on the effects of geomorphic processes through the measurement of differential surface

dynamics, and thus to predict possible effects over time on the visibility of cultural materials, as contrasted with their mere presence or absence (Ebert and Gutierrez 1981). The aerial remote sensor data of the proposed study area will be inspected to see if this is possible in the course of the present project.

Another sort of predictive study, however, will constitute the core of the project proposed here: prediction of site occurrences over space through the use of remote sensor derived ecologic/cover-type mapping. Ecologic/cover-type mapping for purposes of cultural resources prediction was first experimented with by the Branch of Remote Sensing in the National Petroleum Reserve in Alaska (NPRA) beginning in 1977 (Brown and Ebert 1978; Ebert 1978; Ebert et al 1980). The NPRA covers approximately 23 million acres of Alaska's North Slope, and was to be opened shortly to petroleum exploration. It was decided that remote sensing methods should be employed there to arrive at an optimally efficient sampling design in an area that could obviously not be afforded blanket coverage in a few years. Remote sensing activities by the Branch including ecologic/cover-type mapping, were coordinated with on-the-ground activities of the National Park Service's Alaska Area Office to arrive at predictions of the locations and types of cultural resources that can be expected to be encountered in the NPRA during future disturbance of the ground surface. A very similar methodology was extended to the San Juan Basin of northwestern New Mexico in 1979 as part of the Bureau of Indian Affairs' San Juan Basin Regional Uranium study (SJBURUS). Ecologic/cover-type maps and additional supportive data on the distribution of vegetative, geologic, soils and other natural zones were compiled by the Branch of Remote Sensing, and these were coordinated and correlated with cultural resources data collected from all available sources by the National Park Service's Indian Assistance Office in Santa Fe (Drager 1980, 1983).

Ecologic/cover-type mapping as practiced in the NPRA and SJBURUS studies involved the visual interpretation of zones from Landsat black-and-white and color composite visual products. These data allow the economical interpretation of physical surface phenomena on a regional scale with resolution of the order of about 100 meters, clearly compatible with the locational accuracy of placement of most surveyed archeological and other cultural data. Ecologic/cover-types are mapped visually by an interpreter using criteria of color, tone, and texture as seen in the Landsat print coupled with previous knowledge of the region supplied through supportive literature and data. The actual zones mapped during the course of preliminary visual ecologic/cover-type mapping are due to the action of many variables such as soils, underlying geologic strata, the hydrologic balance in an area, landform and slopes, drainage patterns, and vegetation. All of these factors and probably many others cause visible differences in the color and texture of Landsat images which can be interpreted by a trained observer from monoscopic Landsat visual data. The interpreter simply defines zones that look the same, and zones that look different, across the study area on the Landsat scene(s). These zones can be named or numbered to identify which are assumed to be the same. Areas that look substantially different in terms of many properties may be assumed, from an a priori theoretical orientation, to be likely to correlate with differential distributions of cultural sites on the ground--the determinants of resource distributions in each sort of zone being different. In addition, since the ecologic/cover-type zones will form the basis of the choice of the first-

stage sample, which will then be collected in the field, the empirical basis of such a "determinist" theoretical orientation will be testable as well (Drager 1983; Camilli 1983).

A sample stratification is a spatial framework through which an areal sample is distributed across a study area. A large area can, of course, be divided into small squares, and a random sample (at some desired sample fraction) of these squares can be chosen, but such a random sample is likely to be unevenly distributed over the area. Systematic and aligned sample stratifications have been suggested by geographers to overcome this difficulty, but these are uninformed stratifications--they rarely take any natural differences in the landscape and environment into account. Even if we do not know the exact reasons that past cultural sites and materials were placed where they were, we do know intuitively that very rarely will they be randomly distributed across the environment. There should be spatially-defined determinants of where sites are, and what types occur where. These determinants are likely to "multi-variate", just as ecologic/cover-type zones are.

There are two particularly important reasons why multi-variate or multi-causal ecologic/cover-type zones may be more useful for cultural resources sample stratifications than are more specific and specifically-named biological or other zones. One of these is that certain conditions may well have been different in the past than they are today. Rainfall, for instance, may have been only half of what it is now. A map designed to show dominant vegetative species, as most vegetation maps drawn by biologists are, would name a certain species or species mix for each zone. Under 50% of present rainfall, however, this may not have been the species that would have occurred. Reasoning that past inhabitants lived there because of pinyon in the area, for example, might not be reliable. It is, however, likely that the more local determinants of the relative amount of available water--landform and soils, for instance--were the same in the past. Unnamed ecologic/cover-type zones probably reflect the location of past boundaries as well as present ones, implying not specific sorts of causality, but rather differences therein.

Another possibly even more important reason for using multi-variate ecologic/cover-types as the basis of a cultural resources sampling stratification has to do with those processes acting upon archaeological sites from the moment of their deposition until the present day. Such factors affect the integrity or preservation of cultural sites, and they also affect our ability to see them during survey even if they are there. Most of the factors acting on cultural sites through time and modifying their visibility today are measurable in environmental terms: aggradation and erosion, landform modification, biological disturbances, and the nature of vegetative cover in an area. An ecologic/cover-type stratification, being multi-variate in nature, has the potential of measuring all these factors and their contributions to the different strata of which it is composed.

In addition to ecologic/cover-type mapping such as used in the NPRA and SJBRUS projects, an additional sample stratification method will be employed in the Seedskadee project: digital classification using Landsat digital data. This is essentially the same sort of process as used by the visual interpreter for deriving ecologic/cover-type classifications, but proceeds

through computer processing of digital Landsat computer-compatible tapes (CCT's). Four-band multispectral data, rather than being combined to form a visual product, are instead analyzed using multivariate clustering analyses to arrive at zones. There are advantages and disadvantages to both visual (interpreter) and digital processing for arriving at zonations. A human interpreter can integrate known information in the recognition of patterns during his "processing", while computers are stupid in this regard. Digital processing by computer is more accurate and specific, however; each picture element (pixel) in the Landsat frame, 55 x 55 meters in size, is given a specific classification while a human interpreter generalizes to a far greater extent than this. A combination of human interpreter-derived and computer Landsat classifications will be used in the present project to arrive at a preliminary first-stage sample stratification.

Aircraft photographs and possibly ground-truth data collected in the field, along with supportive data gathered in section 3 and detailed above, will be used to confirm the suspected results of the visual and computer classifications. These classifications will then be transferred to appropriate base maps, and will serve as the basis of a sample stratification directed toward 1) predicting possible occurrences of different types of cultural resources in unsurveyed areas on the basis of previously-conducted surveys, and 2) determining the intensity and location of the first-stage sample to be collected in the field, as well as those data to be collected during the course of this sampling. These activities will be described in sections of this proposal to follow.

6) Analysis of Data

This stage of the proposed project will entail the merging of all collected cultural resources, environmental, and other remote-sensor derived data bases. Methods used to accomplish this merging will depend on the nature of the data collected, its spatial compatibility, and other physical factors and will probably be done both "by hand" from base maps overlain with some data sets, and digitally using data systematized for inclusion in a digital geographic information system (GIS). Analysis will include the determination of co-occurrence of cultural resource locations and the specific characteristics of cultural resources which are recoverable from data on previous surveys in the study area and region, with environmental data derived from remote sensor imagery, and other supportive sources discussed above.

A second step in the analytical stage will be an attempt at preliminary explanations of why the cultural data are arrayed in space as they are. This will include consideration of possible past "preferences" as well as environmental changes between the deposition of cultural materials and the present, and the nature of different parts of the study area today and the possible effects of these differences on survey there.

7) Selection and Specification of First Stage Sample

On the basis of analysis and attempted explanation of all correlations between data collected and manipulated during the first six stages of the proposed research, a first stage sample will be specified and selected. First, a practical and useful sample size will be determined based on predicted locations and spacing of cultural resources throughout the study

area, and on the basis of logistical information on the contingencies of survey across this area. Another choice which will have to be made, primarily on the basis of present-day survey logistics in different parts of the study area, is that of the sort of sample units to be used in the first stage sample. Quadrats or square sample units may be statistically desirable compared to transect samples, but are far more difficult to locate in the field and certainly more time-consuming if ground mobility is difficult. Different sorts of sample units, and different sizes of each sort, may be desirable in different defined zones depending on the nature of cultural resources and the environment, too.

Sample locations--those places to be intensively surveyed on the ground for evidence of cultural resources, and to be used as ground-truth areas for determination of the validity of the identification of the ecologic/cover-type zones--will next be specified using the stratification derived in section 5 as a framework. The sample fraction chosen within each zone will depend on the patterning of previously-discovered cultural resources data collected during section 2, and the correlation between these data and those on natural and environmental resources.

Prior to the initiation of fieldwork, forms and formats specifying all data classes to be collected in the field (cultural and natural), the taxonomies and measures to be used in this data collection, and methods of the collection and measurement of these data will be devised; all interested and concerned parties will be consulted in these determinations.

8) Conduct First Stage Sampling Survey

Proper and useful sample survey requires a combination of a well-specified sample (fraction, intensity, unit size and location, etc.) and qualified field survey personnel with knowledge of the cultural resources and terrain in a study area. After careful specification of the sample to be examined on the ground in the course of first stage sample survey, qualified personnel will be found to participate in the survey itself. It is expected that the field crew, including field crew director, will be located and contracted with in the Wyoming areas; personnel will be chosen on the basis of their experience and suitability in the field.

Next, necessary permits and clearances will be obtained in consultation with the Bureau of Reclamation, the Wyoming SHPO, and other appropriate agencies and offices. If a field survey crew from a qualified institution is hired, the field survey activities may be already covered, to some extent at least, by an existing Federal Antiquities Permit. Clearances and permission to enter, cross, and conduct surveys on specific parcels of land will also be obtained in all cases prior to survey activities in the field. This may require contacts with private landowners in some cases, although this will be avoided by adjustment of sample unit placement if at all possible.

Prior to any foray into the field, pre-field logistics will be planned with the aid of remote sensor and other data collected earlier in this project. Travel routes will be planned, time estimates and schedules made, and the locations of sample units will be carefully reviewed with the field crew. At this stage, some adjustments of sample unit placement may also have to be made on the basis of accessibility/inaccessibility, etc. During this phase of presurvey planning, the sampling and data-collecting strategy will be

discussed with the field personnel. In conducting meaningful sample survey, it is imperative that data-collection specification be followed to the letter, so field personnel will be drilled in sample data collection methods. They will also be given a "miniworkshop" in the interpretation and field use of aerial photographs, which will aid them in locating the sample unit locations and help satisfy other logistical needs in the field.

Branch of Remote Sensing personnel will participate in the field survey activities, not directly as cultural resource surveyors, but rather as "monitors" of survey methods, techniques, and conditions. As has been discussed earlier in this proposal, the results of cultural resources survey may well depend as much or more on the methods followed by archeologists doing the survey, and on past and present conditions that affect the nature of cultural resource preservation and visibility as on the actual cultural resource distributions. Branch of Remote Sensing personnel will carefully observe the field crew(s), noting their adherence to the specified data-collection methods and techniques, and the variation in these if such is present (and it certainly will be). In addition, all survey conditions considered pertinent will be recorded in both narrative style and on survey condition data forms which will be designed prior to fieldwork. Survey conditions include specific activities and behavior of the crew, the observation methods employed by these personnel, spacing and cadence of their progress over the landscape, differential abilities as perceived by the observer, the length of time since they have eaten or rested, and myriad other "personal" characteristics of the crew (identities of crew members will, of course, be kept confidential when recording potentially embarrassing information). In addition, natural conditions that might affect survey will be noted as well. Some of these are relatively long-term phenomena--the state of erosion in an area, slope, difficulty of walking, vegetative cover which might obscure cultural materials, and the like. Short-term variables, such as the time of day, sun angle and direction, cloud cover, rain, wind, and an array of other natural factors will also be recorded. Many of these may be apparent before the survey begins, others might not be recognized except in the field during survey. To our knowledge, this is the only cultural resources survey during which the collection of such potentially important evaluative data--in addition, of course, to the collection of cultural resources data--is proposed.

9) Analysis of First Stage Survey Data

Following completion of the first stage sample survey, all data collected during its course will be collated in a form which will facilitate its analysis. Cultural resources data (on cultural resources data collection forms), data on the environmental characteristics of an area collected as a "ground truth" check on the ecologic/cover-type stratification devised using remote sensor imagery, and "survey monitoring data" such as those described in the previous section of this proposal will be arranged and analyzed.

All characteristics of cultural resource data will be subjected to statistical analysis, particularly the examination of sample variances between sample units in each stratum. These statistics will be used to evaluate the "explanatory value" of the sample stratification derived prior to field sampling, and will yield information on possible strata adjustments as well as intensity of survey recommended in future (Class III) surveys that might be conducted in the study area.

Environmental data, and information collected by survey monitors during fieldwork, will be compared with the cultural resources survey data--including instances of the discovery of cultural materials as well as the lack of discovery of cultural materials--to determine whether consistent relationships exist between the finding of certain sorts of cultural materials and variations in the specific conditions of the environment, and of the field survey. This information may affect the interpretation of the cultural resource sample statistics, and will certainly also be useful in specifying preferred conditions and methods of future survey stages to be undertaken at a later date by the Bureau of Reclamation.

10) Compilation of Summary Final Report on Project

The results and conclusions of the proposed project will be presented in a final summary report, which will be compiled and presented to the Bureau of Reclamation following the analysis of data discussed in section 9 of the proposal. This final product will contain a number of related areas of information, analysis, and discussion including the following:

- a) A presentation of the data collected during the course of the Class I literature search and survey. These would include all information collected concerning previously-discovered cultural materials in and adjacent to the study area, and also cultural resource site and materials data collected during the course of the proposed project in the field. Data collection forms will be included, and general classes of information summarized to offer a picture of the nature of cultural resources in the area.
- b) An explanation of the remote sensing methodology and techniques used in the course of this project. These would be explained in terms useful to remote sensing professionals, and also in a step-by-step manner so that they could be duplicated or understood by archeologists wishing to evaluate these methods or apply them to their own similar projects.
- c) An explanation of the theoretical and methodological bases utilized to compare cultural resources, environmental and remote-sensor derived data, and survey "monitoring" data.
- d) An explanation of the theoretical and methodological basis for the specification of sampling strata and the placement and intensity of sample units within the study area.
- e) A complete, explicit definition and description of field survey methodology and an explanation of the reasons that the data classes and methodologies specified were used.
- f) Analysis and discussion of the comparison of data found during field survey and the physical and natural conditions of the survey recorded during the "monitoring" of survey personnel and conditions.
- g) A specification of methods, procedures, sampling strategies and frequencies, and other parameters to be followed during any future Class III survey to be carried out in the area. These recommendations will be based on all of the above data and analyses, and will also be

in accordance with all current federal, state, and other pertinent cultural resource study and treatment requirements.

REFERENCES

Brown, Galen N., and James I. Ebert

- 1978 Ecological Mapping for Purposes of Sample Stratification in Large-scale Cultural Resources Assessment: The National Petroleum Reserve in Alaska. In T. R. Lyons and J. I. Ebert, eds. Remote Sensing and Non-destructive Archeology, pp. 53-63. Washington, DC: Cultural Resources Management Division, National Park Service.

Camilli, Eileen

- 1983 An Ecologic Cover-type Map of the San Juan Basin, Northwestern New Mexico. In D. L. Drager and T. R. Lyons, eds., Remote Sensing in Cultural Resource Management: The San Juan Basin Project. Washington, DC: Cultural Resources Management Division, National Park Service.

Drager, Dwight L.

- 1980 Projecting Archeological Site Concentrations from Cover-type Maps Developed from Remote Sensing Data. In Proceedings of the Conference of Scientific Research in the National Parks (2nd), pp. 151-157. Washington, DC: National Park Service.
- 1983 Projecting Archeological Site Concentrations in the San Juan Basin, New Mexico. In D.L. Drager and T. R. Lyons, eds., Remote Sensing in Cultural Resource Management: The San Juan Basin Project. Washington, DC: Cultural Resources Management Division, National Park Service.

Ebert, James I.

- 1978 Remote Sensing and Large-scale Cultural Resources Management. In T. R. Lyons and J. I. Ebert, eds., Remote Sensing and Non-destructive Archeology, pp. 21-34. Washington, DC: Cultural Resources Management Division, National Park Service.

Ebert, James I., with contributions by Galen N. Brown, Dwight L. Drager, Dick Ping Hsu, and Thomas R. Lyons

- 1980 Remote Sensing and Large-scale Cultural Resources Survey: A Case Study from the Arctic. In T. R. Lyons and F. J. Mathien, eds., Cultural Resources Remote Sensing, pp. 7-54. Washington, DC: Cultural Resources Management Division, National Park Service.

Ebert, James I., and Alberto A. Gutierrez

- 1979 Relationships Between Landscapes and Archeological Sites in Shenandoah National Park: A Remote Sensing Approach. In APT (Bulletin of the Association for Preservation Technology), XI(4):69-87.
- 1980 Cultural Resource Remote Sensing in the Eastern Deciduous Woodland: Experiments at Shenandoah National Park. In Proceedings of the Conference on Scientific Research in the National Parks (2nd), pp. 118-150.

- 1981 Remote Sensing of Geomorphological Factors Affecting the
Visibility of Archeological Materials. In Technical Papers of the
American Society of Photogrammetry 47th Annual Meeting,
Washington, DC, February 22-27, 1981, pp. 226-236. Falls Church,
VA: American Society of Photogrammetry.

INTERAGENCY AGREEMENT

2-07-40-S3351

CLASS I CULTURAL RESOURCES SURVEY OF SEEDSKADEE PROJECT

1. Introduction. This Interagency Agreement (IA) between the Bureau of Reclamation, Upper Colorado Region, hereinafter referred to as BOR, and the National Park Service, hereinafter referred to as NPS, both being agencies of the United States Department of the Interior, is entered into on this 17th day of September, 1982.
2. Authority. This IA is entered per the program authority of the Reclamation Act of 1902 (43 U.S.C. Ch. 12), as amended and supplemented, the Archeological and Historic Preservation Act of 1974 (Public Law 93-291), as amended, and Protection and Enhancement of the Cultural Environment (E.O. 11593 dated May 13, 1971). Contracting authority is according to the Economy Act (31 U.S.C. 686), as amended and supplemented.
3. Purpose. BOR requires a Class I Cultural Resources Survey of the areas surrounding Fontenille Dam and Reservoir.
4. General Statement of Services. Services to be provided under this agreement are those required to:
 - 4.1. Class I. Conduct a Class I Cultural Resources Survey and Remote Sensing Survey to assess the general nature of the archeological and historical resources, and to identify districts, sites, buildings, structures and objects of interest or importance in architecture, history, or prehistory which will be within the study area.
 - 4.2. Study Design. Prepare a predictive study design based on the available information.
 - 4.3. Ground Truth Survey. Conduct a ground truth survey on a sample of areas within the project area defined below and illustrated in Figure 1. [see Figure 4-2].
5. Study Area Description. The Seedskadee Project is located on the Green River in the Southwestern Desert Region of Wyoming, approximately 30 miles northeast of Kemmerer and 31 miles south of Big Piney. Fontenille Reservoir, which is within the Seedskadee Project, provides fishing and recreational opportunities as well as water for irrigation of the desert around the reservoir. The reservoir is approximately 6,505 feet above sea level at normal pool level. The Seedskadee National Wildlife Refuge is also contained within the boundaries, along with some privately-owned land. The State of Wyoming has developed some farm lands and is presently growing hay to feed the large elk herds that habitat western Wyoming in the winter months. The Fontenille unit has power generating capabilities and helps supply power to western Wyoming and surrounding states.

The area is mainly desert common to this part of Wyoming and the vegetation is mostly sagebrush. The weather conditions range from very hot 100°+ in the summer to well below 0° in the winter at which time the reservoir is frozen over.

6. Specific Area Description. The areas to be surveyed are all lands under the management of the BOR for the Seedskadee Project as described in the land descriptions below. Lands within the take line of the project that are National Wildlife Refuge, private lands, or land under management by state or other Government Agencies are included.

T 26N	R 112W	parts of Section	35
T 25N	R 112W	parts of Sections	4, 5, 8, 17, 20, 21, 22, 26, 27, 28, 29, 33, 34, 35
T 24N	R 112W	parts of Sections	4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 20, 23, 24, 25
		all of Sections	21, 22, 26
T 24N	R 111W	parts of Sections	29, 30, 31, 32
		all of Sections	25, 26, 27, 28, 33, 34, 35, 36
T 24N	R 110W	parts of Sections	13, 14, 15, 21, 27, 28, 36
		all of Sections	22, 23, 24, 25, 26
T 23N	R 112W	parts of Section	1
		all of Sections	12, 13
T 23N	R 112W	parts of Sections	6, 7, 14, 15, 16, 17, 21, 22, 23, 25, 26, 33, 36
		all of Sections	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 18, 19, 20, 24, 27, 28, 29
T 23N	R 110W	parts of Sections	29, 31, 32, 33, 34, 35
		all of Sections	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 36
T 23N	R 109W	all	
T 24N	R 109W	parts of Sections	18, 19, 30, 31, 36
T 24N	R 108W	all of Section	31
T 23N	R 108W	all of Sections	4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
T 22N	R 111W	parts of Sections	4, 11
		all of Sections	11 21 31 10, 12, 14, 24, 26
T 22N	R 110W	parts of Sections	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 21, 22, 23, 25, 28, 33, 36
		all of Sections	10, 14, 15, 16, 17, 18, 19, 20, 24, 30, 32
T 22N	R 109W	parts of Sections	3, 5, 28, 29, 31, 32
		all of Sections	1, 2, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 21, 22, 23, 24, 26, 27, 30, 34
T 22N	R 108W	parts of Sections	7, 9, 13, 15
		all of Sections	3, 4, 5, 6, 8, 10, 11, 12, 14, 16, 18, 20, 22
T 21N	R 110W	parts of Section	2
		all of Sections	4, 8, 10, 12, 13, 22, 24, 26
T 21N	R 109W	parts of Sections	5, 9, 15, 16, 18, 20, 23, 26, 36
		all of Sections	1, 2, 3, 4, 10, 11, 12, 13, 14, 24, 25, 28, 30, 32, 34
T 20N	R 110W	all of Sections	2, 10, 12, 13
T 20N	R 109W	parts of Sections	22, 26
		all of Sections	6, 8, 18, 20, 28, 30, 32, 34, 36
T 20N	R 109W	all of Sections	2, 4, 12
T 20N	R 108W	all of Section	20

T 19W R 108W parts of Sections 4, 6, 8, 22

all of Sections 10, 16, 18, 20, 21, 26, 28, 34

7. Detailed Statement of Services. Provide the following services for the Class I survey.

7.1. Schedule. Prepare a schedule showing the proposed order to carry out the work and its estimated dates for completion. This schedule will be worked out in detail with the Bureau of Reclamation.

7.2. Literature Search. Conduct literature and document reviews to determine known resource locations and to aid in the prediction of site locations. This will be prepared to the specifications of the Wyoming SHPO guidelines.

7.3. Evaluation. Evaluate the data adequacy and reliability.

7.4. Synthesis. Synthesize cultural, historical, and environmental data to allow categories of resources to be formed and evaluated for significance.

7.5. Remote Sensing. Perform a remote sensing (aerial reconnaissance) assessment of 185,556.7 acres of land described in Section 6 above.

7.6. Study Design. Prepare a detailed, predictive Study Design in accordance with accepted professional standards. Within the realm of the Study Design, design a sampling plan which would result in a statistically valid predictive model of the nature of the distribution and location of cultural resources within the study area. If viable, this model may be incorporated into a Class III Survey and any specific mitigation plan which may be developed and performed separately. The predictive study design will be developed in consultation with the State of Wyoming and BOR.

7.7. Ground Truthing. Conduct a ground truth survey of a sample of (selected) geographic and environmental areas within the study area. The ground truth survey will be used to verify the models developed from the data collected in the Class I and aerial reconnaissance surveys.

7.8. Report. Prepare a final report of the work performed. This will include but not necessarily be limited to a synthesis and evaluation of the data collected, a discussion and evaluation of the remote sensing activities (this will include a justification of why one method or technique was chosen over another), a discussion of the Study Design, a discussion of the results of the tests, and an evaluation of each recorded site's eligibility to be included in the National Register of Historic Places.

8. Deliverables.

8.1. Monthly Progress Reports. Prepare a monthly written report to be submitted to BOR. This report shall be a summary description of the performance, problems, and status of the agreement. In addition, the first report shall contain the schedule required in 7.1. above.

8.2. Study Design Report. Submit a written, detailed revised schedule for the conduct and completion of the interpretation of the data from the Class I Survey and the completion of the ground truth testing survey. It will contain a detailed description of the services and strategy planned for their accomplishment. This deliverable satisfies the requirements of 7.6. above.

8.3. Final Reports. Submit a draft and a final report detailing the findings of the Class I Survey, remote sensing activities, Study Design, and ground truth surveys. This deliverable includes all the requirements of 7.2 through 7.8, above.

9. Deliverable Due Dates. The Study Design, Draft Final, and Final Report due dates will be established by the dates submitted in the first Monthly Progress Report (Sec. 8.1 above). For convenience of reference the due dates will be entered below after the first Monthly Progress Report is reviewed.

<u>Report</u>	<u>Due Date</u>
1. Study Design Report	
2. Draft Final Report	
3. Final Report	

The Monthly Progress Reports shall be submitted for the previous month within the first 10 days of the subsequent month.

10. Payments and Funding. Payments and funding for this IA shall be as specified below.

10.1. Payments. Payment for NPS services shall be made via SF-1081, Voucher and Schedule of Withdrawals and Credits. NPS shall periodically submit SF 1081 supported by payroll records, and obligation documents for purchase of outside services, equipment, and supplies. NPS shall bill for the actual costs of the work, overheads, equipment, supply, or other charges not to exceed the amount of \$110,000.

10.2. Funding. Funding in an amount sufficient to cover the estimated costs of this IA is prevalidated and reserved herefore. Funding is available from fiscal year 1982 appropriations.

11. Changes. If required by the performance of this IA, changes may be made to the provisions. Changes may be initiated by written notice to the other party 30 days prior to the proposed effective date of the change. If the change is agreeable to the other party, and funding is available, the change may be implemented. Changes shall be documented by a modification of this IA. The modification shall be signed by responsible, authorized officials at the same level as the original signatory parties.

12. Termination. If required by either party, this IA may be terminated. Such termination action may be initiated by written notice to the other party 60 days prior to the proposed effective date of the termination. A modification to this agreement shall be issued to document the effective

date of the termination. The termination modification shall be signed by responsible, authorized officials at the same level as the original signatory parties. Prior to the effective date of the termination, the rights and duties of both parties shall continue in full force and effect.

13. Property. The clause entitled "Government Property (Cost Reimbursement Nonprofit)" which is cited at 41 CFR 1-7.402-25(b), FPR 1-7.402-25(b), is hereby incorporated by reference. The following changes are hereby made to the clause:

13.1. Acquisition Threshold. Paragraph (c)(2) of the clause cited above is hereby modified. Change the amount from \$1000 to \$200.

13.2. Title Threshold. Paragraph (c)(3) of the clause cited above is hereby modified. Change the amount from \$1000 to \$200.

13.3. Vesting of Title. Title of any property having an acquisition cost of \$200 or more, shall vest in Bureau of Reclamation.

BLANK PAGE

MODELING CLIMATIC AND LANDFORM FACTORS AFFECTING
THE CHARACTER OF THE ARCHAEOLOGICAL RECORD IN ARID LANDS:
A REMOTE SENSING APPROACH IN SOUTHWESTERN WYOMING

LuAnn Mendenider
Department of Anthropology
University of New Mexico
Albuquerque, New Mexico 87131

James I. Ebert
National Park Service
Division of Cultural Research
Branch of Remote Sensing
P.O. Box 26176
Albuquerque, New Mexico

Abstract

The forces and processes which comprise the natural environment affect the character of the archaeological record in two basic ways. First, those factors which control the humanly important environment and thus the patterning of human behavior across the landscape are responsible for the location and nature of the pre-depositional archaeological record composed of objects and materials lost, discarded, or abandoned in the past. The moment these materials relinquish their roles in the living cultural system, they fall prey to the same natural variables which now affect them in different ways, determining the nature of their deposition in sediments, their dispersion by erosion or other mechanical processes, and their obscuration by vegetation -- in short, their integrity and visibility. Both of these phases in the life history of the archaeological record must be taken into account before it can be used to explain human cultural organization in the past. Particularly in arid lands, climate and landform are two of the most important natural variables affecting the present day archaeological record. Models relating natural variables and archaeological method and theory are discussed in this paper, with special reference to the pre- and post-depositional history of the archaeological record in the Bridger or Green River Basin of southwestern Wyoming, where remote sensing techniques are being applied to the mapping of environmental zones relevant to geomorphological processes which bear on the deposition, preservation, and visibility of archaeological surface data. Finally, as a result of the consideration of the differential effects of natural processes on the archaeological record, it is suggested that the least disturbed, most visible, and most useful archaeological surface record may be found in semi-arid regions where desertification is a major problem today. It is in these regions that archaeology may hold the most promise for helping us learn from the behavior and mistakes of the past.

Archaeology and Archaeological Data

Archaeology is the study of past human behavior, adaptation, and organizational processes. The data upon which these studies are based is the archaeological record, which is composed of the materials that past people have lost, discarded, or abandoned in the course of their lives and activities. The materials people use leave the cultural context and enter the archaeological context when they are disposed of: at some point after they are dropped on the surface of the earth, they come under the influence of depositional processes and are incorporated in sediments and soils. Deposition most often occurs in the context of aggradational processes which bury cultural materials, although there are situations in which cultural materials remain on the surface of the ground. Some depositional processes are cultural, consisting of burial by human activity, but these are less common than natural depositional events. Materials buried in layers or "levels" are often assumed to be the result of single occupational episodes (Conkey 1980), but this is not necessarily always the case. The nature of the deposited archaeological record is controlled by the periodicity or "tempo" (Binford 1982:16) of occupation or use of a place and its relationship with the periodicity of depositional processes acting on cultural materials. Artifacts dropped sporadically might be expected to be covered by depositional processes occurring more often than episodes of dropping, while those lost or abandoned more continuously will often be subjected to deposition after several episodes of site occupation, forming more ambiguous "levels." For instance, if a site is occupied or is the locus of activity several times between each rainy season, there may be more than one episode of activity represented in each depositional level. This poses problems for the archaeologist attempting to sort out the results of periodic human behavior in that "...demonstrably associated things may never have occurred together as an organized body of material during any given occupation" (Binford 1982:17-18).

Once cultural materials are deposited, and become part of the archaeological record, they are acted upon by another set of post-depositional natural processes. Most processes which disturb or act upon the surface or subsurface of the earth also affect archaeological deposits. Biological processes such as "faunalurbation" and "floralurbation" (Wood and Johnson 1978) modify deposited materials, as do a host of other mechanical and chemical processes. Foley (1981) presents a taxonomy of five sets of natural processes responsible for the burial, movement, destruction, and modification of archaeological deposits. Discarded materials enter the archaeological record through burial by cultural or natural agencies; once assemblages are buried they remain in place, or they may be moved through stream action, sediment movement, faulting, or mass-wasting. At the same time certain materials may or may not be altered by physical and chemical agencies while in or on the ground. Foley also identifies what he calls small scale oscillation processes including water or wind action, animal burrowing, root action, and human disturbances which also act on the discarded archaeological record.

Natural post-depositional processes can alter or destroy archaeological materials, but they also play a role which is vitally important to the archaeologist: they expose these materials, making them visible and thus available for study. Most archaeology carried out in the United States today is undertaken in the context of cultural resource management assessments, which entail the systematic blanket survey of the surface of the earth in

areas which are to be disturbed by reservoir construction, strip mining, or other engineering and resource extraction activities. Archaeological materials which are completely buried are not found during such survey; rather, it is only those cultural materials which are exposed but not totally destroyed which are found and serve as the basis of archaeological study and interpretation. It is thus in the short and relatively uncommon interface between the exposure of deposited materials and their dispersal or destruction that archaeologists are availed of anything at all to work with, and it behooves archaeologists to carefully consider the nature and actions of the processes which afford them their basic data.

Curiously, archaeologists seldom consider the importance of natural processes in shaping the data which they depend upon, at least to judge from an examination of the current literature. Archaeologists usually undertake "blanket" survey of the archaeological resources in an area, locate what they term sites or clusters of materials indicative of occupation or activity loci, put dots on a map where these sites are located, and begin a discourse about where past people preferred to live, population densities in the past, and mobility patterns. It is obvious, of course, that another step must come first -- the consideration of natural processes affecting the deposition, modification, and exposure of archaeological materials which must be undertaken before any attempt is made to interpret the archaeological records as it is found. This paper describes an attempt at such control of natural depositional and exposural processes in the Bridger or Green River Basin of southwestern Wyoming.

The Study Area

The study area discussed in this paper lies in the Green River Basin of southwestern Wyoming between $41^{\circ}35'$ and $42^{\circ}12'$ north latitude, and $109^{\circ}23'$ and $110^{\circ}13'$ west longitude (Fig. 4-1). This area, which is drained by the Green River and lies for the most part below 8000 feet in elevation, is located between the upthrust belts of the Wind River and Gros Ventre Mountains and is bounded by a low divide from the Washakie and Great Divide Basins to the east (Knight 1950). The mountain ranges in the region are cored by Precambrian sediments surrounded by more recent Cambrian to Cretaceous rocks. The strata of the Green River Basin itself are superimposed on Cretaceous rocks, consisting of poorly cemented Eocene lacustrine and fluvial beds consisting predominantly of sandstones or shales. These sediments were dissected during the late Tertiary and Pleistocene, creating a landscape dominated by stepped terraces capped with gravels (Fisher and Hakiel n.d.). Fluvial, aeolian, and gravitational processes have further altered the landscape in post-Pleistocene times, giving rise to a varied and diverse region when considered on a small scale. The Green River Basin is quite arid today and probably has been for some time, receiving generally less than 400-500mm of rainfall in most places annually. Even on high plateaus and slopes, vegetation cover is generally quite sparse, usually covering not more than 20% of the ground surface.

Archaeologically, the Green River Basin seems to have been inhabited at relatively low population levels since the beginnings of North American settlement. PaleoIndian, Archaic, and Plains Indian adaptations believed to have been based on hunting and gathering, and possibly partially agricultural Fremont peoples have left their remains there for at least 10,000 years

BLANK

PAGE

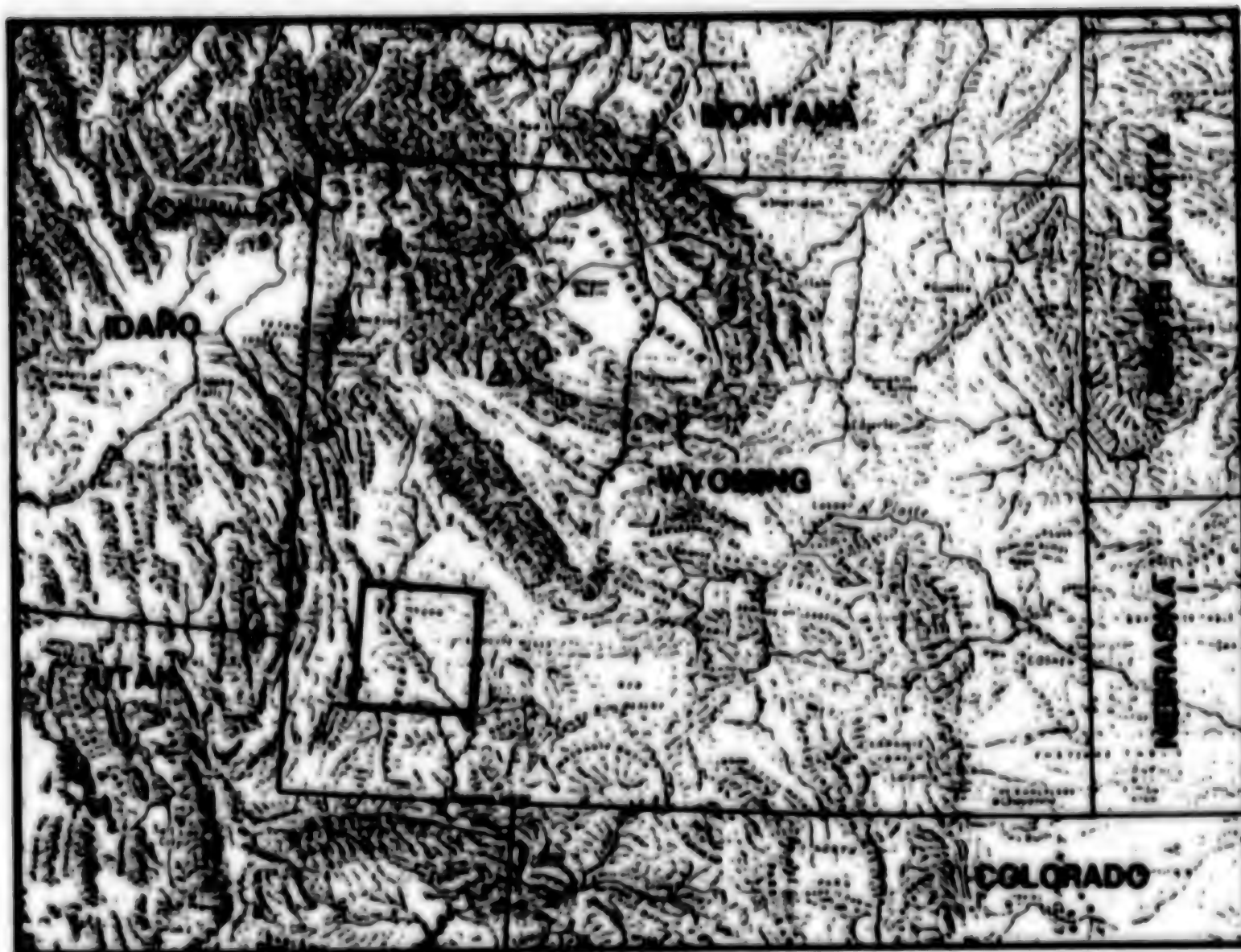


Figure 4-1. The study area in the Green River Basin of southwestern Wyoming.

(Aikens 1966, Sharrock 1966, Jennings 1978, Frison 1978), and it appears that there may actually have been little difference in the lifeways of these people over this relatively long time span. The majority of archaeological sites found in the Green River Basin are "Archaic," a broad typological category encompassing virtually all the materials dating from about 9000 BC to historic times, with assemblages consisting of stone tools and containing no pottery. Many "sites" found in the Green River Basin are hundreds of yards in length and contain tens to hundreds of hearths, and have relatively sparse but even concentrations of lithic artifacts. These are very likely the results of the reoccupation of places over many years, coupled with depositional and erosional processes encouraging the formation of overlain assemblages or palimpsests.

The Green River Basin is to be the site of an archaeological experiment coupling the mapping of natural zones and processes with on-the-ground archaeological survey carried out by the Branch of Remote Sensing, an Albuquerque office of the National Park Service, in 1983-1984. This experiment is directed toward the evaluation of the cultural resources of lands under the responsibility of the Bureau of Reclamation surrounding the Seedskadee National Wildlife Refuge along the Green River (Fig. 4-2), and is designed to incorporate remote sensor data input in the predictive modeling of archaeological site locations and characteristics there. The results of this predictive model will be tested through the on-the-ground cultural resources survey of 3500 acres of the study area, a survey which will be carried out in an "off-site" manner (Foley 1981a, b) in which the minimal unit of archaeological analysis is the artifact or feature rather than the site, as it is in most traditional archaeological surveys. The first step in conducting this archaeological survey is to be the mapping of areas of differential geomorphological processes in the study area.

Mapping Geomorphological Zones (Fig. 4-3)

Mapping zones of differential geomorphic surface processes affecting the archaeological record over a 559,000 hectare (1,380,700 acre) study area requires a data source which provides a regional perspective while allowing the discrimination of different sorts of areas with resolution at culturally and archaeologically relevant scales. Remote sensor data, particularly those derived from satellite-borne sensors, are ideal for this sort of application, particularly where little on-the-ground geomorphological mapping has taken place in the past. The basic data source used in geomorphological mapping of the Seedskadee Project Area was a 1:100,000 scale Landsat color composite visual product. Composed of an overlay of bands 4, 5, and 7 data from the Landsat Multispectral Scanner (MSS), this image has a ground resolution of about 70m X 70m, and approximates a color infrared view of the area imaged. Color infrared accentuates vigorous vegetation, aiding in the discrimination between areas of growing plant cover and bare earth, a capability particularly useful in defining differential surface processes.

Mapping was initiated by overlaying a sheet of frosted mylar on the 1:100,000 scale Landsat scene of the study area, and placing these two registered sheets on a light table. Nearby, within easy reach, 1:80,000 scale black-and-white photo prints covering the area to be interpreted were arranged in mosaic

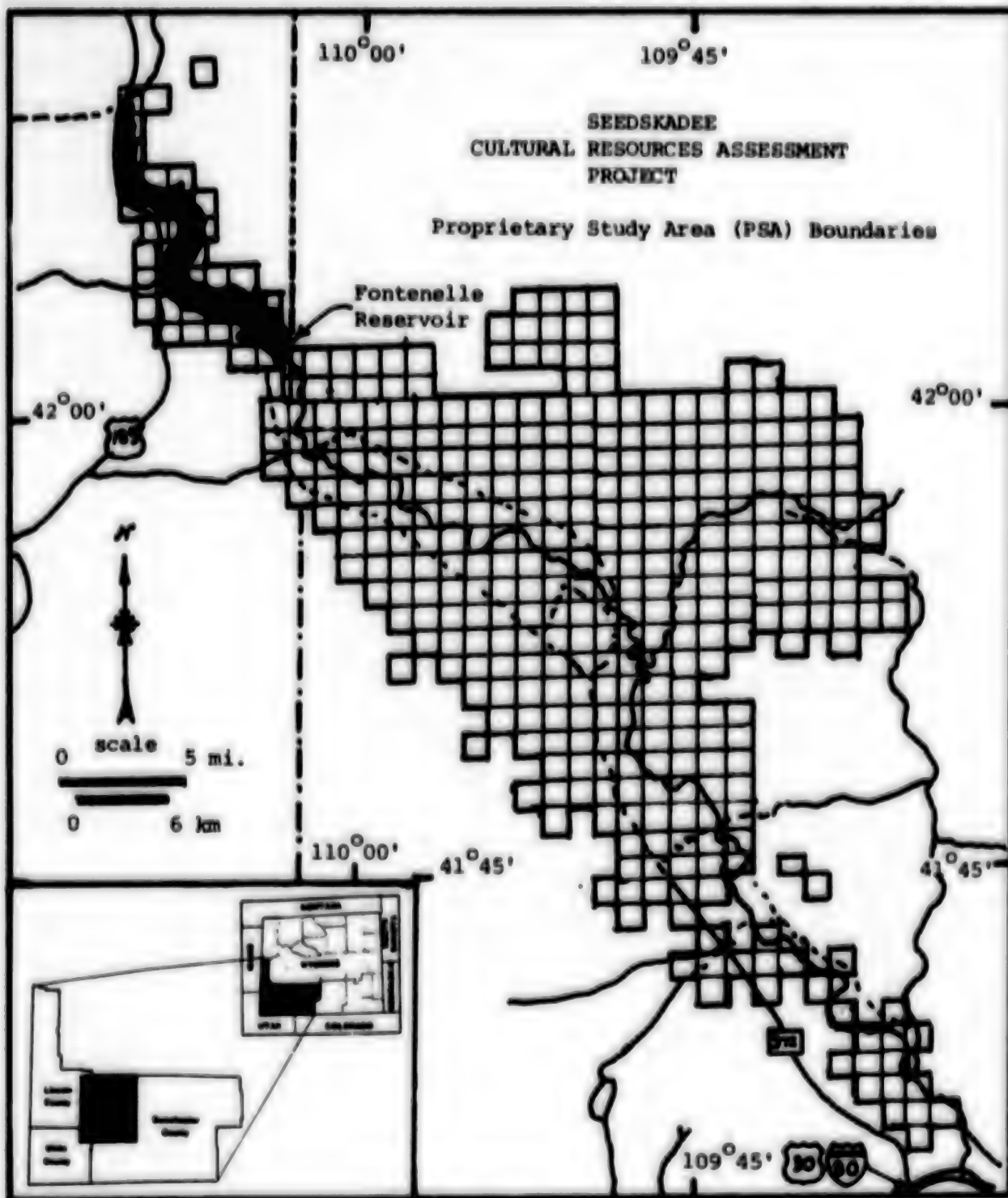


Figure 4-2. Study area within which on-the-ground survey will be conducted to test conclusions generated on the basis of remote sensing and other environmental data.

fashion. By checking back and forth between the Landsat image and the aerial photographs, the boundaries of zones that appeared to contain different sets of geomorphic processes were drawn on the mylar overlay. State of Wyoming geology maps and USDA Soil Conservation Service provisional county soils maps (Sweetwater, Lincoln, and Uinta Counties) were also consulted during the interpretation process. Although the information available from the Landsat image, the aerial photographs, and the maps was different, it was also found to be complementary. The resolution of aerial photographs is many times greater than Landsat resolution, of course, and allowed small-scale topographic patterning to be identified. For instance, individual sand dunes and interdunal flats are easily distinguished on 1:80,000 scale aerial photographs with the unaided eye or using a mirror stereoscope with 0.8x to 6x magnification. Once areas characterized by dunes were located on the aerial photographs, the identical area on the Landsat image was checked and the tonal and textural qualities of that area noted. This recognition pattern then allowed the discrimination of additional dune areas directly from the Landsat image, subject to checking using the aerial photographs after such an interpretation was made. In some cases the geological and soils maps aided in the checking and placement of boundaries, although these maps are far more generalized than the geomorphological mapping done from the Landsat data. Photointerpretation could have been performed using only the aerial photographs, but this would have required the construction of a control network for slightly less than 100 prints, a very difficult task. Landsat data is collected from about 530 miles altitude, and is therefore quite accurate geometrically -- an ideal medium for environmental mapping such as that undertaken in the Seedskadee Project Area.

Two mapping stages were actually required to arrive at the final Seedskadee geomorphological zone map. In the first of these, the zones which were largest in area were distinguished and drawn first, and the smaller zones were drawn in last. This provides a good basis for deciding just what sorts of zones, and how many of them, can be distinguished but results in splitting zones, redrawing boundaries, and a "messy" map. When this first map was completed, a clean sheet of mylar was overlain on the Landsat image, and the map was redrawn, this time starting with the smallest zones. The zones interpreted from Landsat and aerial photographic interpretation, as well as their recognition patterns, a description of landforms they contain and dominant geomorphological processes within each zone, and soil and geological deposit correlations are summarized in Table 4-1.

Geomorphological Zones

The fifteen geomorphological zones distinguished in this first interpretive step (Table 4-1) fall under six general headings:

1. Terraces formed largely by fluvial processes, either presently active or having taken place in the more/less recent past, possibly as early as the Pleistocene. In the most recently active of these areas, channel and overbank deposition dominate the depositional processes, while on later terrace surfaces slopewash, sheetwash, and aeolian processes are common.

GEOMORPHOLOGICAL ZONES

Copyright © 2004 by John Wiley & Sons, Inc.



Fig. 1. 1999-2000 Survey Area

Our products are the result of intense research, development, testing, and refinement. We are committed to providing you with the highest quality products and services. We are committed to providing you with the highest quality products and services.

- 1

- Index**
 Author Index
 Subject Index
 Cross-Index
 Glossary
 Appendix
 Bibliography
 Index

- 1-800-855-8888

- Name _____
 Sex _____
 Age _____
 Address _____
 City _____
 State _____
 Zip _____

2. Playas and Flats consisting of relatively flat areas of slow deposition of fine-grained sediments facilitated by either internal or external drainages. When dry, these areas are subject to aeolian deflation.

3. Dunes which in the study area occur for the most part not in extensive "fields" but rather interspersed throughout badlands, flats, or along the edges of intermittent watercourses (where sand is plentiful) or where mesatop scarps cause the wind to drop its sediment load. Presently-active dunes areas, which form the majority of the areas included in this category, are characterized by connected crescentic or barchan dunes. At least two areas of earlier, relatively well-stabilized parabolic dunes are also found in the study area.

4. Badlands consisting of highly-eroded shales with a dense and reticulate drainage, in most cases interspersed with flats, dunes, and small remnants of earlier surfaces of "mesa" areas.

5. Mesatop areas which are the more or less dissected remnants of earlier surfaces. Four mesatop areas were distinguished on the basis of their landform and the fact that at least some of the vegetative cover, probably dominated by Basin big sagebrush (Artemisia tridentata subsp. tridentata) and grasses, was distinguishable on the Landsat image in these areas, in contrast to much of the rest of the study area.

6. Agricultural Areas, irrigated with water from the Fontenelle Reservoir or the Green and Black's Fork Rivers, have been extensively modified and probably do not need to be further considered by archaeologists, at least those searching for surface remains.

Natural Processes, Sediments and Artifacts

A number of zones expected to exhibit differential sets or "suites" of geomorphological processes in the Seedskadee study area in Wyoming's Green River Basin have been identified on the basis of the interpretation of Landsat multispectral scanner data and aerial photographs. To relate these zones to expected differences in the archaeological record that might be found from one to another, the next step is to arrive at a set of preliminary statements or expectations about the effects of geomorphological processes on the archaeological record. The processes of artifact transport, burial and exhumation can be thought of as a subset of the more general processes and forces which affect sediments of any kind, and even introductory texts (e.g., Selley 1976) often contain detailed discussion of such processes. For example, as illustrated in Figure 4-4, sediments and larger items may be transported from their point of origin with relative ease in high-energy environments; in low-energy situations, sediments and artifacts are more often either

BLANK

PAGE

TABLE 4-1
Geomorphological Zones

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
T ₁ - Active Terrace	Braided highly-reflective streambed, whitish-gray, very narrow in most places, with 1-3 water-filled (black to dark blue) channels.	Presently active streambed, water-filled with exposed gravels and sediment deposits in places. Very flat or slightly sloping gradient. Braided river, 1-3 channels. Flood plain shows much evidence of relatively recent channel shifting.	Fluvial processes including point bar deposition and other transitory channel deposits, lag deposits. Erosion and change in streambed deposits and morphology probably very high during high flow periods. Activity very recent in active channel. At least annual periods of significant deposition.	V ₁	Qal
T ₂ - Recent but Presently Inactive Terrace	Continuous or discontinuous dark red to pink vegetated area to side of T ₁ unit, "random" textured and interlaced with sinuous abandoned channels of lighter color.	Abandoned but recently active terrace(s), higher than T ₁ but below T ₂ , relatively discontinuous at a large scale due to cutting by abandoned channels associated with T ₁ . Well-drained, may have several levels.	Fluvial erosion and alluviation due to high water and/or seasonal floods causing overbank deposits and oplay deposits; vertical accretion of fine-grained sediments. Deposition during floods enhanced and probably "confused" by retentive effects of relatively dense vegetation. Love (p.c.) feels that T ₂ has been aggrading since the mid-1800s on the basis of buried layers of cinder from Union Pacific steam trains.	V ₁	Qal
T ₃ - Less Recent (Holocene and Tertiary Pleistocene) Terraces	Discontinuous, relatively highly reflective (light gray to light greenish gray), even-textured surface between the edges of T ₁ /T ₂ units and bounding mesa scarps only along the Green River in the study area.	Gently-sloping, older terrace surfaces above T ₁ /T ₂ , dissected and/or obscured by slopewash in some places but relatively intact in others. Drained by sheetwash and infiltration into T ₂ /T ₁ . Several terrace levels, some of which may be pre-Holocene, in some places.	Slopewash, sheetwash, and aeolian processes dominant. Surface stabilized by vegetation in many places. Many small, shallow, gentle-sided arroyos cut surface, appears relatively little violent erosion or subsurface exposure. Some colluvium/mass-wasting deposits at boundary with bounding scarps.	U ₁ , U ₃	Qal

TABLE 4-1 (cont.)

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
V ₂ - Canyon Bottom Deposits	Dark to light pinkish and greenish, slightly sinuous canyons bounded by lighter bare rock rims in higher dissected mesa-top areas (H ₂ , H ₃ , H ₄). Boundary extremely well-defined in most places.	Narrow, steep-sided canyons with vegetated bottoms, steep side walls and bare rock rims. Well-drained, low to moderate gradient, ephemeral (seasonal) drainages.	Colluvial fills from above and on rock rims may form much of canyon fills. Likely catastrophic floods which transport even larger materials long distances occur annually; little systematic sediment deposition in canyon bottom or along rock rims.	V ₃	Sh ₁ , T ₂
P - Playas	Highly-reflective (white), well-bounded, limited areas with, in wet cases, water retained at center of basin (black, little sediment load). Extremely even texture.	Distinctly-bounded, internally-drained playas or basins containing extremely fine-grained alluvial deposits transported only over short distances. Probably originally formed by aeolian deflation which is still important in their maintenance when dry. Very flat surfaces except for possible small blinnet areas.	Aeolian deflation of fine sediments when surface dry, sheetwash transport of sediments to center of basin where gently deposited in level-lying strata at relatively slow rates.	Fine, silty or sandy clayed deposits very poorly drained.	Almost exclusively within Th.
P - Alluvial Flats	Slightly less reflective surface than P deposits (white to gray-white) with some noticeable textural qualities on surface. Shapes more sinuous and linear than P deposits in most cases; seem to follow stream courses or consist of filled valleys.	Continuous, well-bounded, externally-drained areas of fine, level surfaced deposits dissected by narrow, steep-sided downcut arroyos.	Aeolian deflation of fine sediments and sheetwash transport of sediments in all but central incised arroyos which are initiated in topographically higher areas not within the flats themselves and drain only center axis of flat. Bounded distinctly in some cases by low scarp or sloping valley margins (some slopewash), in others by discontinuous to continuous dune fields comprised of deflated flats materials.	V ₁	Almost exclusively within Th.

TABLE 4-1 (cont.)

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
P_2 - Alluvial Flat (Secondary Deposition)	Surface tone appears very similar to P unit, although slightly more vegetation may be present (very slightly darker than P). Surface texture very even, deposits fan-shaped.	Very flat to slightly sloping fan deposits derived and transported some distance from P deposits, dissected by very narrow central arroyos as in P unit.	Present sheetwash deposition and some aeolian deflation, but surface better cemented than P unit surfaces. Deflation, deposition rates probably very low. Little vegetation on surface, surfaces sorted fine materials. Central draining arroyos probably recent, formed after previous transport of P_2 materials.	V_1	Qal
D - Dune Areas	"Fish-scale" textured, alternating white/yellowish-gray/light bluish-gray areas. Weakly-bounded in many cases from surrounding P and S areas, but well-bounded when occurring to windward of steep scarp edges of N units. Interspersed in most cases by remnants of earlier, once continuous surfaces (N units) or small, discontinuous areas with the appearance of flats (P).	Weakly-bounded and relatively discontinuous areas of connected crescentic, shls, or "barrenoid ridges" (McKee 1979) dunes trending generally in concord with N and SW wind directions but direction affected locally by prominent landscape feature controls. Dunes interspersed with small and discontinuous areas of badland scarps, remnant "moatop" (N) or portions of dissected plateaus with grass and sagebrush vegetation, and by through-feeding drainages. Small interdunal flats ubiquitous, may be internally-drained or connected ("desert pavement" of Fisher -d Nahiel s.d.) but overall landscape externally drained. Bounded by S or P areas (source of aeolian materials, along with interdunal flats) or N scarps (wind-shadow and barrier effects). Some vegetation on dune tops affords slight stability, but recently active.	Aeolian deflation internally, plus transport from external sediment sources (P and S) and watercourses. Ponding and sheetwash in internally drained interdunal flats with materials transported only over short distances. Drainage within unit probably slow even where external, some ponding along such drainages as well. Aeolian deposition of dunes may successively cover previous interdunal areas, expose new ones. Some downcutting of narrow, sharp-sided arroyos. Where bounded by badland or mesa areas, mass-wasting/colluviation and slopewash processes may contribute somewhat to sediment deposition.	All within U_3 soils.	Largely on Tb , some in and near Qal.

TABLE 4-1 (cont.)

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
D ₀ - Older, Stabilized Dune Fields	Barber, reddish or brownish-green areas otherwise resembling B areas in texture, with some obvious imbedded more active dune (B) areas. Linear striations caused by tails of long parabolic dunes in N-to-S orientation gives first impression of Landsat image striping, although at slightly wrong angle across image.	Long (in some cases, 3-4 miles) parabolic or blowout dunes reflecting wind direction from almost due west. Ridges stabilized with vegetation resembling or even heavier than mesquite (M) vegetation. Some more recent deflation within old dune fields, imbedded B unit areas. In some places, old dune fields also dissected by more recent, cross-cutting fluvial drainages.	Parabolic dunes well-stabilized and not presently active, for the most part. Fluvial erosion dissects small portion of D ₀ , also some aeolian deflation and ponding in interdunal areas between the legs of the parabolas.	Seem to originate in U ₁ soils, extend into and overlie small part of U ₁ soils.	Tu1
B - Badland Areas	Most "randomly" textured of all interpreted zones, mostly white/whitish-yellow/gray to gray-green in tone with islands of tone more characteristic of B and M units. Bounded only indistinctly by D, P, and M areas but quite distinctly by N and V ₁ areas.	Badlands with high density reticulated drainage network separating relatively steep shale slopes. Interspersed with alluvial flats along through-cut drainages, some small scattered discontinuous or continuous barchanoid dunes, small remnants of older surface (M areas).	Particulate movement (mass-wasting) due to low infiltration rates. High runoff is channeled across flats with some deposition of fine materials, runoff drains into ephemeral drainages cutting across B zones. Some aeolian deflation along flats with deposition in scattered dunes. Quickly-retreating slopes may allow the "mass movement" of not only sediments but also archaeological materials from slope crests and small M areas to the foot of slopes where they are covered by active slopewash.	B, P, and D areas all correspond closely with U ₂ soils.	Tb, some Qal in boundary areas.
A - Agricultural Areas	Dark red, very well-bounded, relatively even-textured areas above Fontenelle Reservoir.	Artificially and naturally leveled and bounded irrigated areas in canyons and valleys above the dam and reservoir.	Severely disturbed, recently alluviated by fine sediments from the reservoir.	V ₁	In Tm, Tgt & Tw (Wash Formation) areas above dam

TABLE 4-1 (cont.)

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
M - Mesa Top or Plateau	Reddish to reddish-green, dark, relatively even-textured areas with little apparent fluvial or aeolian deflation along southwest side of Green River Terraces (T_2 and T_3).	Relatively continuous early surface now weathered to gently rolling upland plateau, only moderate fluvial dissection in places. Surface characterized by small clumps of silty sand moved only short distances by aeolian processes and anchored by sage and grass bunches (shrub coppice dunes) with materials derived from shallow blowout areas up to 50 cm below plateau surface, now covered with sandy gravel. Linear windward scarp or cliff tops bounding this zone also contain lee dunes derived from restricted "desert pavement" or blowout areas to their immediate windward.	Microtopography formed by aeolian processes operative over short distances forming coppice and lee dunes. Fluvial processes of relatively little consequence except at edges of M area and sides of sloping drainages where erosion and hillside processes important in deposition, exposure of sediments.	T_1	Tb
M_2 - Dissected Mesa Top	Similar in tone to M areas, but texturally interspersed with deflated or eroded (D, F, or B) tones and textures. Discontinuous, occurs predominantly in lower-lying areas to immediate west of Green River. Bounded indistinctly to distinctly by B and D units.	Discontinuous remnants of early surface interspersed with blowout and badland areas characterized by relatively poor but external drainage. Mesatop remnants topped with sagebrush, grasses; little vegetation in areas between mesatop remnants.	Primarily fluvial processes, hill-slope processes causing erosion and mass-wasting at scarps separating older and newer surfaces. Some deposition of sediments from badland slopes by sheetwash along intermittent watercourses, and by ponding in interdunal areas within dunes dispersed very discontinuously through M_2 . Aeolian deflation in dried flats.	U_3	Tb

TABLE 4-1 (cont.)

Stratum	Recognition Pattern	Landform Description	Geomorphic Processes	Soils	Geology
M ₃ - Dissected Mesa Tops, Upland	Discontinuous dark to light pinkish green interspersed with dendritically-branching canyon areas of light gray to grayish-green. Occurs in upland portion of study area to the north of a line drawn from west to east through the Fontenelle Reservoir.	Discontinuous upland surface dissected by steep, rocky-sided canyons with extensive bare rock rim borders. Relatively little extent original mesa or plateau surface between the rock rim remains, but appears similar to continuous M areas in other respects. Original surface areas grade into bare rock with extensive areas of very thin soil mantle between. Canyons (bottoms) host well-defined T ₀ .	Aeolian processes deflate borders of M surfaces, deposit shallow mantle covering bare rock rims. Aeolian and sheetwash processes result in sediment movement across rock rims; little aggradation, although some coarser materials may be left in place. Mass-wasting at cliffs bordering canyons, colluvium forms T ₀ fills.	U ₁	Tb, Tai
M ₄ - Canyons and Ridges	Long, linear patterns similar in tone to M areas grading into lighter-toned hillsides (gray to gray-green) and occurring in extreme southeast corner of the study area.	Parallel east-trending canyons separated by W-E ridges, V-shaped valleys with most of variation in vegetative cover due to north- vs. south-facing slope insolation. General slope of landscape sharply upwards toward the east.	Fluvial processes in canyons and their tributaries (all apparently only seasonally active), mass-wasting on steep slopes, particularly those with southern aspect where less vegetation allows more active hillside processes. Some true floodplain deposits on canyon floors in westernmost portion of this unit.	U ₁	Tgm, Th

TRANSPORT ENERGY	High	Transported	Transported
	Medium	Transported	Not Transported (not buried)
	Low	Not Transported	Not Transported (buried)
		Sediments	Artifacts
		LOAD	

Figure 4-4. Model of disjunction between the transportation vs. deposition of archaeological artifacts and their matrix of lighter sediments

buried or exhumed depending on whether energy distributions are temporally continuous or discontinuous. The forces responsible for moving sediments and associated archaeological materials include the active forces of the physical world as well as resisting forces due primarily to friction.

The primary physical agents affecting objects in the Seedskadee study area are those involving wind, gravity, rainfall, and water flow. Wind transports items through rolling, saltation, and suspension. While sand particles are more easily transported than clay particles, the range of sand transport is much more limited than that of silts and clays transported in suspension. Clays, because of their cohesive properties, require a greater wind velocity to initiate aeolian transport. Once this minimum wind velocity is obtained, however, their smaller size and lighter weight allow them to be moved greater distances (Chapil 1945). This means that clays and silts transported by winds may exit the study area while sands remain in the system. Those clays and silts which remain may be deposited primarily in playas and on flats within the area. The force with which gravity moves objects depends on the angle of the slope on which the objects rest. For example, in their study of Epipalaeolithic sites along the coast of Israel, Fuchs *et al* (1977) found little evidence for the operation of gravitational effects, even those assisted by water, on slopes of 2-5 degrees. On greater slopes, however, there may be pronounced gravity effects on archaeological materials, as demonstrated by Rick (1976) for slopes varying from 10 to 44 degrees at Ccurimachay in Peru, and by Kornfeld (1982) in shell-midden sites in California on similarly pronounced slopes. Ellison (1944) observed that large and/or high velocity raindrops are responsible for dislodging and transporting large particles, sometimes even larger than surface runoff can move. Finally, the actions of both low- and high-energy fluvial events on the distribution of archaeological artifacts and bones has been well documented by Gifford and Behrensmeyer (1977) and Isaac (1967), among others.

While initiated by these applied physical forces, movement is inhibited by the resisting forces of inertia and friction. Inertia is a function of the resting mass of an object. Friction depends on several factors. Generally, cohesive clays have a much higher coefficient of friction than do larger-sized particles; the disjunction in velocities required to move fine clay particles vs. sands and larger silts is known as the Hjulstrom anomaly. The effects of friction may be enhanced or reduced by the presence of water. In the case of sand and other large or heterogeneous sediments, water may act as a lubricant and reduce friction (Selley 1976), while some clays swell when water becomes available and friction is enhanced rather than reduced. Another criterion which governs the effects of frictional forces on the resistance of particles to movement is the surface area in contact with other particle surfaces. An object with a relatively large surface area or base in contact with other particles (for instance, an artifact lying on a sand surface), offers more area for frictional forces to operate upon than does an object with a smaller base area.

What effects, then, might these processes have on archaeological material and sites? To begin to answer this question, it may be desirable to employ two often used archaeological terms: "site," which is taken to mean a cluster composed of a number of spatially associated artifacts, and "isolated occurrence," meaning a single artifact not found in close physical proximity to other artifacts. In different sorts of geomorphological contexts, the action and interaction of dominant processes might be expected to act upon the archaeological record composed of sites and isolated occurrences in various ways. The following taxonomy is a preliminary attempt at predicting some of those ways.

I.a. Low-Energy Fluvially Aggrading Environments will be characterized by transport and burial processes during which heavier items would be expected to be aggregated and buried while lighter items might be transported away from the locus of original deposition. Thus, neither sites nor isolated occurrences should be visible or present in such areas.

I.b. Low-Energy Fluvial Erosion will cause heavy items, such as cores or hammerstones, to remain undisturbed, while lighter items will be transported away. This might be expected to result in "sites" containing only heavy items, with other "sites" containing lighter and more scattered materials appearing as downflow shadows of the clusters of heavier materials.

II. High-Energy Fluvial Environments should exhibit a variety of transport, burial and exhumation processes. Gifford (1981) observed the actions of highly viscous mudflows capable of moving the largest bones, and presumably artifacts as well, with no sorting. Little surface evidence of this sort of transport may occur, however. An experiment carried out by Isaac (1967) in Kenya in which a grid was planted with 25 large bifaces and 45 smaller artifacts, and subjected to several flows of unknown intensity or duration, resulted in some artifacts being transported as much as 75 meters within only two years. One cluster of several large artifacts remained in almost their original places, while only 13 of the 45 smaller items could be found. It can be anticipated, therefore, that several years of such fluvial activity might result in few if any sites which will remain visible and retain any integrity. Any isolated occurrences found in such areas are of suspect origin.

III.a. Low-Angle Hillslope areas provide an environment in which water may assist gravity in rearranging distributions of artifacts. On a very shallow slope, sheetwash may carry light artifacts downslope. Some medium-sized artifacts may be transported or at least disturbed through raindrop action, while larger artifacts remain essentially in place. Very low-angle slopes may not affect the distributions of any originally deposited artifactual materials (on the order of 2-5 degrees according to Fuchs et al 1977).

III.b. On Steep Hillslopes, gravity, if given even a little assistance from other forces, may overcome the resting inertia of deposited objects. On steep slopes, heavy objects may roll to the bottom of the slope and

be buried while light objects travel shorter distance and become dispersed on the slope itself. This would hold for slopes of angles near or greater than 20 degrees such as those at the rockshelter of Gcurimachay discussed by Rick (1976).

IV. Mass-Wasting is a process which can totally destroy site context and introduce artifacts into other geomorphic environments through, for instance, the collapse of a mesatop scarp edge into a high-energy fluvial environment. Sites which become visible through mass-wasting events will probably be visible for only a very short while.

V.a. In Aggrading Aeolian environments, it can be expected that all sites and isolated occurrences will be buried. Since aeolian deposition is a relatively continuous process in dune field areas, as well as a somewhat "gentle" one, sites deposited through aeolian aggradation would be expected to maintain a high amount of spatial integrity.

V.b. Aeolian Erosion presents the possibility that sites and artifacts buried either by aeolian deposition or other depositional processes may be reexposed with a certain amount of at least horizontal spatial integrity. Since dune fields are composed of areas which are being aggraded and degraded serially (causing "moving dunes" interspersed with interdunal flats, it is likely that sites and artifacts will be continually reexposed, creating a palimpsest. In such areas one might expect to find expanses of high density artifact distribution with little obvious clustering and complicated, superimposed patterning. Since these are continually being exposed, there would always be some areas where little dispersion or disturbance of exposed artifacts has had time to take place. In addition, dunes impede fluvial throughflow across interdunal flats in many cases. These factors, rather than or at least coupled with aboriginal preference for dune areas, may be responsible for the fact that a great preponderance of archaeological sites are found in dunes in southwestern Wyoming, as well as in other places around the world.

The processes operating in each of the fourteen geomorphological zones mapped from Landsat and aerial photographic interpretation (excluding agricultural areas) are summarized in Table 4-2. The ways that these processes affect the archaeological record have been described briefly above. In addition, Table 4-2 also lists expectations for the visibility and integrity of deposited and/or exposed archaeological materials in each zone. Using these complementary sets of information, one can begin to anticipate the quality, character, and accessibility of the archaeological record in the study area.

Process	Mesatop				Bedland	Dune		Terraces				Playa/Flat		
	H	H ₂	H ₃	H ₄		D	D ₀	T ₁	T ₂	T ₃	T ₄	P	F	F ₂
I. Low-energy Fluvial														
a. Aggrading		L				L				L		L	L	L
b. Eroding	L	L	L			L	L			L				
II. High-energy Fluvial				H	H			H	H		H			
III. Hillslope														
a. Low-angle		L			L					L				
b. High-angle	H	H			H									
IV. Mass-wasting		H		H	H									
V. Aeolian														
a. Aggrading	L		L		L	L				L				
b. Eroding	L	L	L		L	L	L			L		L	L	L
SURFACE VISIBILITY	h	m	h	l	m	h	m	l	l	m	l	m	m	m
INTEGRITY	m	h	m	l	l	m	l	l	l	h	l	m	m	m

L,l = low m = medium H,h = high

Table 4-2. Energy regimes for specific geomorphological processes in the mapped zones.

The visibility of the archaeological record will be enhanced if no sediment deposition occurs following artifact loss or discard, or if erosion follows aggradation. From this, it might be expected that archaeological materials on mesatops and dissected mesa uplands as well as in recently active dunes would be quite visible unless obscured by heavy vegetation (a possibility on mesatops). Cultural materials, at least locally deposited items, will be rarely encountered in recently active terrace surfaces in rivers and canyons due to burial and high-energy transport.

The information content of artifacts which can be seen and thus "used" by archaeologists may vary greatly, too. If artifacts have been disturbed and moved some distance from their point of origin through taphonomic processes, they will be removed from the context of their associations with other artifacts and cultural features. If the spatial relationships between artifacts has not been altered, on the other hand, questions concerning the spatial patterning of assemblage components can be addressed. Of course, if no aggradation or erosion takes place between artifact loss or discard and the observations of the archaeologist, such spatial relationships will be preserved. This is unlikely, however, in any active environment. More often such conditions will be met when deposition and subsequent exposure are not violent. In the study areas, such "gentle" deposition and erosion are expected only on dissected mesatops and older, more stable gravel-topped terraces, and in some recently-active dune areas. More recent and active terraces, older dunes, and badlands will contain archaeological remains with little structural integrity and information value.

When criteria for both archaeological visibility and integrity must be met -- and they must for all surface archaeological interpretation -- only mesatops, dissected mesa uplands, and recent dune fields suggest themselves as likely candidates. Unfortunately, mesatops are also likely to be heavily vegetated with grasses and sagebrush, and to support an actively-forming organic layer of top soils, thereby hiding most nonstructural archaeological remains. In playas and alluvial flats, artifacts may or may not be visible depending on position in the aggradation-erosion cycle. Playa and alluvial flat sediments and the cultural materials they contain can be expected to be moderately distorted, particularly with respect to the spatial positions of light artifacts.

Field Testing and Some Expected Results

The verification of the geomorphological zonation and preliminary expectations concerning its implications for the archaeological record in the Seedskadee Project Area depends, of course, on field testing. This stage will be carried out during the summer of 1983, when a survey of about 12km² will be carried out. This survey will be undertaken in an "off-site" (Foley 1981a) manner in which the artifact is the minimum analytical unit rather than the site because this method of data recovery is expected not only to yield far more information than traditional site survey about the patterning of prehistoric behavior, but also should provide the sorts of data needed to control for the local effects of natural processes on the post-depositional archaeological record. An extremely intensive survey will be carried out on 30, 500m x 500m survey units and 6, 1km x 1km units using a 5-meter transect spacing (30m-50m has been standard for transect spacing in Wyoming since 1978). This survey is designed to insure the discovery of virtually all artifactual materials -- on "sites" or between -- in relatively large and contiguous survey areas. Individual artifact locations will be measured to within 5mm accuracy (in distance) using electronic distance measurement (EDM) equipment. The 3-dimensional artifact locations derived

using such methods will provide not only spatial locations of artifacts, but also control on microtopography not available using US Geological Survey maps.

Survey areas will be chosen to cover each of the geomorphological zones derived during the mapping stage of this project in order to determine whether different sorts of geomorphological processes are taking place within the different zones, and if the boundaries are correctly placed. At the same time artifact locations and attributes are being measured in each sample area, observations on the landforms present and the processes affecting the archaeological record in the past and present will also be measured and recorded.

It is expected from the outset that the processes and landforms observed in the field will differ somewhat from those derived through remote sensor data interpretation. Remote sensor data, while regional in scope and allowing very accurate definition of the boundaries of large zones representing the combination of "suites" of geomorphological processes such as those described earlier in this paper, are of relatively low resolution. In addition to regionally-mappable processes, natural factors acting on the archaeological record are of a very local or small scale as well. An illustration of this is provided by the comparison of the geomorphological zones described in this paper and those defined as archaeologically significant in the Green River Basin by Fisher and Hakiel (n.d.). Fisher and Hakiel identified eight landform or environmental categories in the Upper Green River Basin (north of the Seedskadee Project Area, but very similar to it): field and lee dunes, desert pavement, plateau deposits, floodplains, canyon floors, slopewash and badlands. Their "hypothesis (is) that one... variable, viz geomorphology, can be crucial in the determination of site location," (n.d.:3), by which they mean that prehistoric peoples in the area preferred certain landscapes or geomorphological "situations" to others, elected to live in certain places, and thus left the archaeological record to be found there today. This approach is clearly different that that which is pursued here; our experiment focuses not on the preferences and feelings of prehistoric people but rather (at least first) on natural processes which affect the way we as archaeologists see, think about, and feel about the archaeological record. Yet, Fisher and Hakiel's theoretical orientation is probably not so much responsible for the differences between their zones and those presented here as is their perspective--their delineation of geomorphological zones was done on the ground rather than using remote sensor data. Neither of the two viewpoints is "true" or "false"--each offers different and perhaps quite complementary insights. Fisher and Hakiel's zones or landscape types are far better defined in the small scale, that is, from a local perspective, than are those we have listed, while our zones are broader and more regionally inclusive. Some of our zones include several of those advanced by Fisher and Hakiel (for instance, our dune areas include both their field dunes and desert pavements, and our badlands include their slopewash, badlands, and at least some field dunes and floodplains). At least one of Fisher and Hakiel's landform types, lee dunes, is visually indistinguishable on virtually any remote sensor data, but occurs along the leeward edges of mesatops and mesatop remnants, so this type can be expected in the mesatop zone we have defined. It is expected that the summer 1983 field work and checking the Landsat and photographically derived geomorphological zonations will allow the integration of these two levels of generalization and scale to the advantage of archaeology in the study area.

A Closing Comment

To close this paper, we would like to advance yet another idea rather than summarize what has been said thus far. This idea springs from the insights gained in the remote sensor interpretation and geomorphological mapping, and especially from thinking about what sorts of processes affect the archaeological record in various sorts of environments. It has to do with just where the "best" or most useful archaeological surface remains might be sought by archaeologists. When undertaking an archaeological assessment such as the Seedskadee Cultural Resources Assessment Project, which is designed to approach an understanding of the distribution of prehistoric peoples and what they did in the past, looking for "good" archaeology is not the point. If, in truth, however, archaeology can help us understand how people in the past dealt with their environment to the benefit of people faced with such environments today, then it might be in our best interest to hunt for places on Earth where such problems exist and where the archaeological record is of such a nature that it might help us deal with them.

One such place, we conclude, is the relatively unstable interface between truly arid lands and the more habitable parts of the globe--those semi-arid regions where "desertification" is a major concern. It is in climatically unstable areas that active sand dune fields, which represent a dynamic combination of aeolian erosion and deposition, are found. As discussed above, the relatively gentle deposition and exhumation of cultural remains and materials in dune fields result in their quick encapsulation in dry deposits, and their exposure with little expectable horizontal displacement. It is in semi-arid regions that the surface archaeological record can be expected to be most visible, to have the most horizontal integrity, and--most importantly-- to be the most useful to the present inhabitants of developing countries in terms of the lessons we can learn from the past.

REFERENCES

- Aikens, C. Melvin
1966 Fremont-Promontory-Plains relationships in northern Utah. Anthropological Papers of the University of Utah, No. 82. Salt Lake City: University of Utah Press.
- Binford, Lewis R.
1982 The archaeology of place. Journal of Anthropological Archaeology, 1:5-13.
- Chepil, W. S.
1945 Dynamics of wind erosion: I. Nature of movement of soil by wind. Soil Science, 60:305-320.
- Conkey, Margaret W.
1980 The identification of prehistoric hunter-gatherer aggregation sites: The case of Altamira. Current Anthropology, 21(5):609-620.
- Fisher, Peter P., and Nicholas E. Hakiel
n.d. The influence of geomorphology on archaeological site location in the Upper Green River Basin, Wyoming. Paper on file at Archaeological Rescue, Star Route 2, Box 90, Pinedale, Wyoming, 82941, USA.
- Foley, Robert A.
1981a Off-site archaeology: An alternative approach for the short-sited. In Hodder, I., G. Isaac, and N. Hammond, eds., Patterns of the Past: Essays in Honor of David L. Clarke, pp. 157-183. Cambridge, England: Cambridge University Press.
1981b A model of regional archaeological structure. Proceedings of the Prehistoric Society, 47:1-17.
- Frison, George C.
1978 Prehistoric Hunters of the High Plains. New York: Academic Press.
- Fuchs, C., D. Kaufman, and A. Ronen
1977 Erosion and artifact distribution in open-air epipalaeolithic sites on the coastal plain of Israel. Journal of Field Archaeology, 4(2):171-181.
- Gifford, Diane P.
1981 Taphonomy and palaeoecology: A critical review of archaeology's sister discipline. Advances in Archaeological Method and Theory, 4:365-438.
- Gifford, Diane P., and Anna K. Behrensmeyer
1977 Observed formation and burial of a recent human occupation site in Kenya. Quaternary Research, 8:245-266.
- Isaac, Glynn Ll.
1967 Towards the interpretation of occupation debris: Some experiments and observations. Kroeber Anthropological Society Papers, 37:31-57.
- Jennings, Jesse D.
1978 Prehistory of Utah and the Eastern Great Basin. Anthropological Papers of the University of Utah, No. 98. Salt Lake City: University of Utah Press.

Knight, S. H.

- 1950 Physical aspects of the Green River Basin and adjacent mountain ranges. Fifth Annual Field Conference, Southwest Wyoming, pp. 75-80. Casper: Wyoming Geological Association.

Kornfeld, Marcel

- 1982 Down the hill without a site. Wyoming Contributions to Anthropology, 3:91-104. Laramie: Department of Anthropology, University of Wyoming.

Rick, John W.

- 1976 Downslope movement and archaeological intrasite spatial analysis. American Antiquity, 41(2):133-144.

Selley, R. C.

- 1976 An Introduction to Sedimentology. London: Academic Press.

Sharrock, Floyd D.

- 1966 Prehistoric occupation patterns in southwest Wyoming and cultural relationships with the Great Basin and Plains cultural areas. Anthropological Papers of the University of Utah, No. 77. Salt Lake City: University of Utah Press.

Wood, W. Raymond, and D. L. Johnson

- 1977 A survey of disturbance processes in archaeological site formation. In Schiffer, M. B., ed., Advances in Archaeological Method and Theory, Vol. 1, pp. 315-381. New York: Academic Press.

BLANK PAGE

BACKGROUND AND ENVIRONMENTAL INFORMATION

by

Arthur K. Ireland and Dwight L. Drager

In order to perform a project of the type and magnitude of the Seedskadee Cultural Resources Assessment, it is necessary to obtain as much information about both the natural and cultural resources of the project area as possible before the project is carried out.

In the case of the Seedskadee project, information on the known cultural materials are relatively easy to obtain. The Wyoming State Historic Preservation Office maintains an archive at the Department of Anthropology of the University of Wyoming in Laramie, Wyoming. For a modest fee, in this case \$500, all reports and site forms available from that office can be copied and made available. In addition, maps showing the locations of known sites and survey areas are also housed at this archive and a photographic negative of the map for the Seedskadee area was made by a printing shop in Laramie. In this way, base data on known sites in and around the project area was collected.

Data needs to be recorded on maps offering maximum detail at a scale that efficiently represents the project area. US Geological Survey maps on 7.5-minute quadrangle sheets at a scale of 1:24,000, or 2000 feet to the inch, with a contour interval of either ten or twenty feet have been standardized for the entire country and are available for the entire project area. A complete set of these maps was purchased and an index of their locations was prepared (Fig. 5-1).

A project such as this also needs to have a good base map of the project area. Numerous maps from various sources were collected and examined and a final composite map was made from county maps of Sweetwater, Lincoln, and Uinta counties produced by the Wyoming state highway department. These maps were chosen because they are extensively annotated with unimproved county roads. It was assumed that considerable travel to isolated parts of the project area would be required and that extensive road maps would be of the most value to the project. These maps were formed into a mosaic of the project area and latitude and longitude markings as well as Universal Transverse Mercator indications were made on the boundaries (Fig. 5-2).

Maps were also collected of the soils (Fig. 5-3) and geology (Fig. 5-4) of the project area. The soils maps were generated by the Soil Conservation Service and the geology maps were made by the Geological Survey of Wyoming from maps first made by the US Geological Survey.

To combine all the environmental information with the cultural information, it was decided to transfer all data to a standardized form which would include the appropriate information. We were requested by a number of offices to use the InterMountain Antiquities Computer Survey (IMACS) forms. This is a form developed at the University of Utah which includes considerable information on three categories of data: administrative and environmental, prehistoric, and historic. The form is continually under development and went through at least two major revisions during the course of this project alone. However, it does include relevant categories and, as an attempt to standardize site listings, can be of significant value. For this reason, an abbreviated version of the form was designed which included all the information which was necessary for this project. In conjunction with this form, a computerized search and retrieval program was written to operate on computer equipment housed at the Branch of Remote Sensing. This program allows the entry of all data in the

appropriate format, allows that data to be corrected if errors are made or if new data becomes available, will print the entire file of data, or will search for specific entries by entry or site number, geographic area, or specific variables within the data. Using this program, all existing site forms, some 853, were coded and entered onto disks. These sites were then searched and form the basis for the information which was used to generate a predictive model of the project area (see Drager, "A Possible Predictive Model . . .", this volume). A complete printout of all the site forms and of the computer program are included with this report.

110°30'		110°						109°30'	
Lake Mountain	The Hogback	La Barge	La Barge SE	Oasis Well	Sugar Loaf	Teakettle Butte	Juel Spring	Big Sandy Reservoir	Big Sandy Reservoir SE
Fort Hill		Names Hill	Anderson Canyon	Monument Butte	Monument Butte NE	Twelve-mile Knoll	Fourmile Knoll	Eden Reservoir West	Eden Reservoir East
		Fontenelle Reservoir	Fontenelle Reservoir SE	Blue Forest	Twelve-mile Sink	Simpson Gulch SW	Simpson Gulch SE	Farson	Fifteen-mile Spring
Round Mountain	Graham Reservoir	Shute Creek Lake	Fontenelle	McCullen Bluff	Thoman School	Gasson Bridge	Pittman Well	Clay Buttes	White Rocks
Willow Springs	Opal	Cow Hollow Creek	Fontenelle SE	Whiskey Buttes	Lombard Buttes	Big Island Bridge	Chidman Ranch	Clay Buttes SW	Clay Buttes SE
Little Round Mountain	Roberson Creek	Church Butte NW	Moxa	Seven-mile Gulch	Blue Point	Stevens Flat	Austin Ranch	Scott Spring	Pilot Butte
Mulkey Spring	Hampton	Church Butte	Verne	Granger	Little America	Bryan	Peru	Green River	Kanda
Carter	Austin Reservoir	Millersville	Wildcat Butte	Antelope Knoll	Antelope Knoll NE	McKinnon Junction		Firehole Basin	
110°30'		110°						109°30'	

Figure 5-1

Index Sheet of USGS 7.5-minute quadrangle maps of Seedskaadee Cultural Resources Assessment Area

Figure 5-2

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

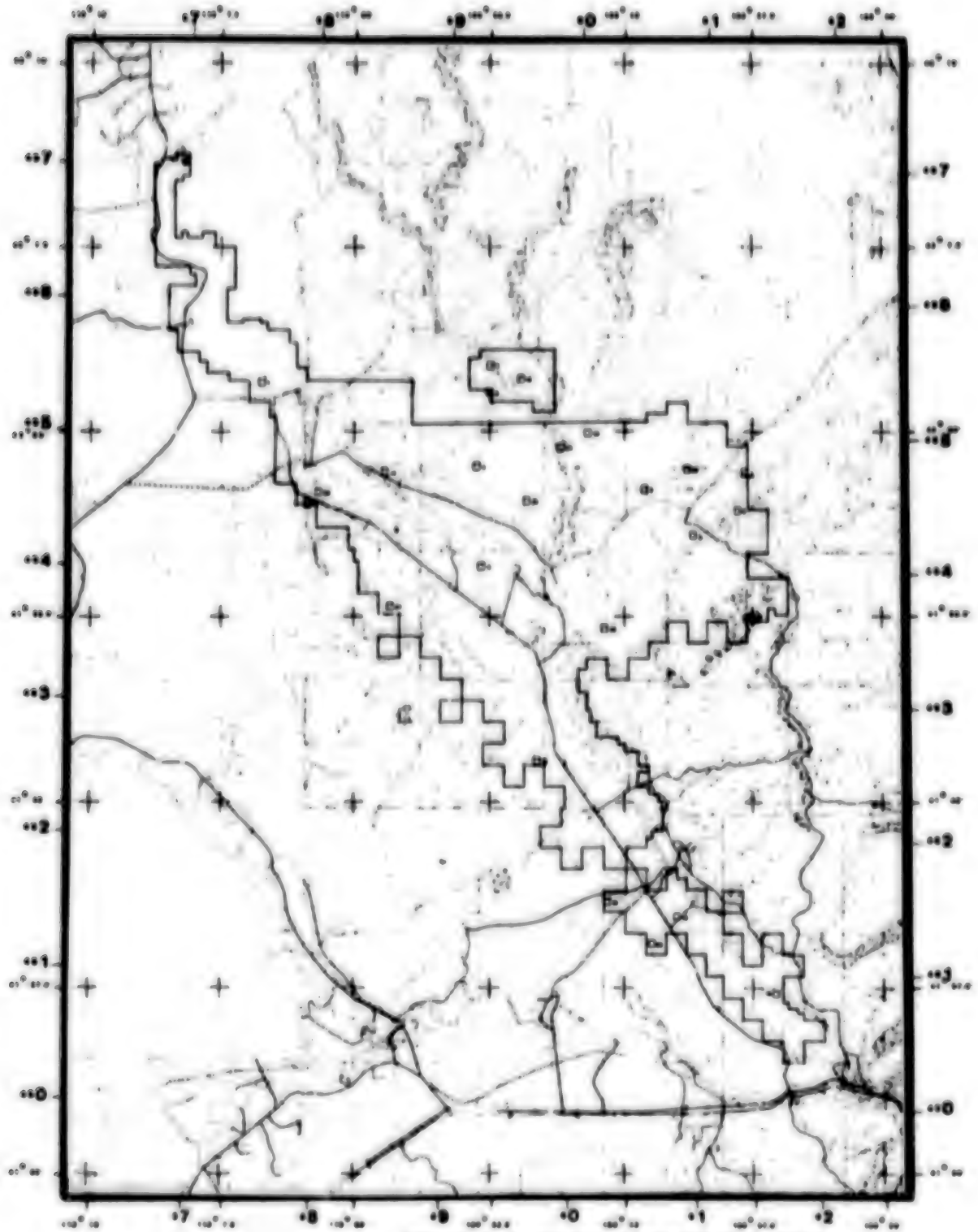
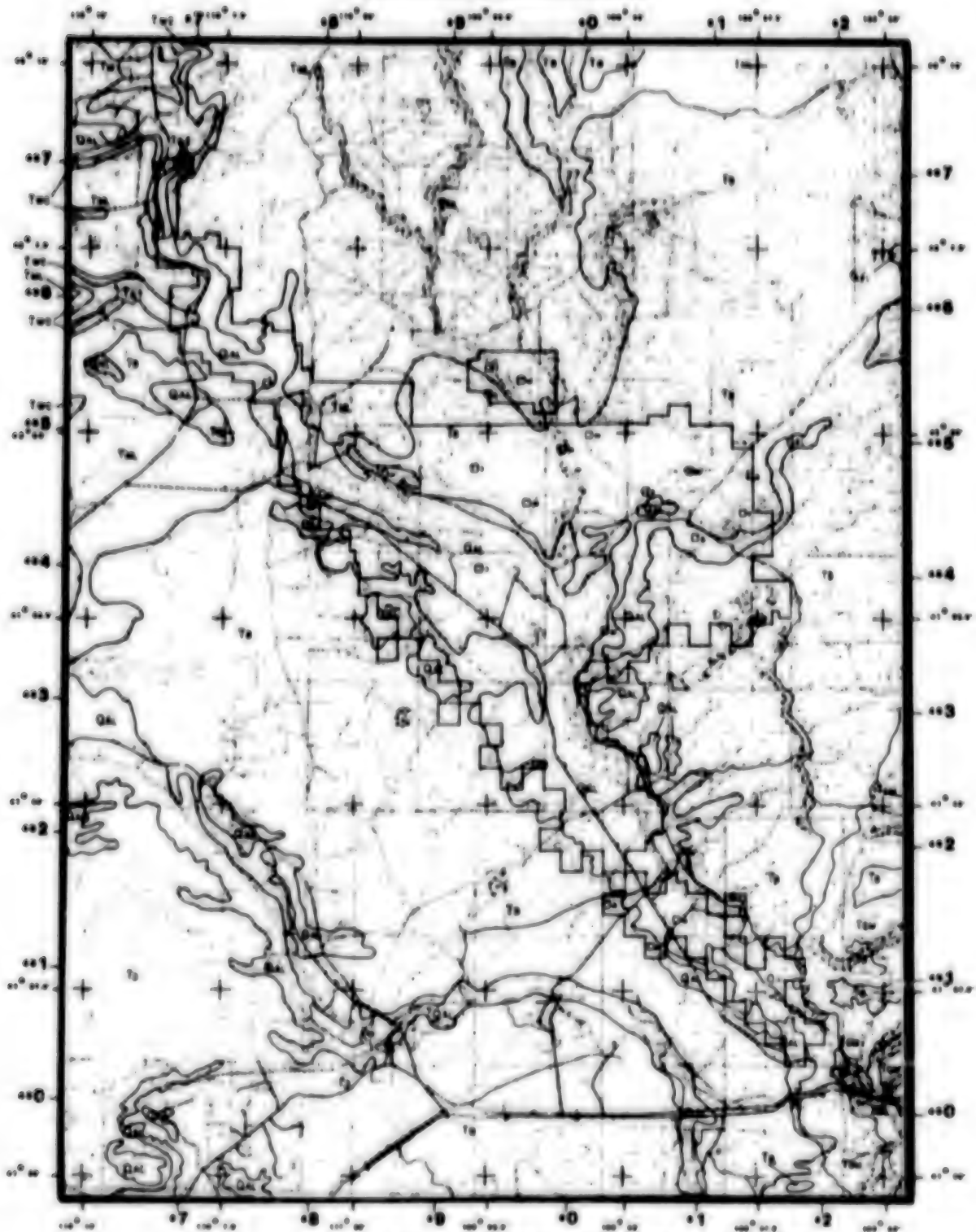


Figure 5-3

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

GEOLOGY MAP



SEEDSKADEE PROJECT AREA BOUNDARIES AND SURVEY BLOCK LOCATIONS

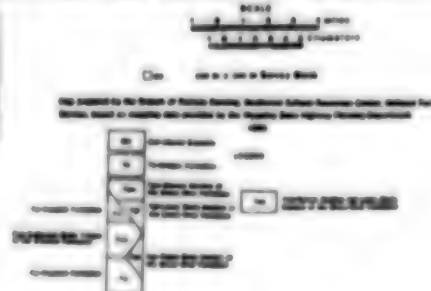
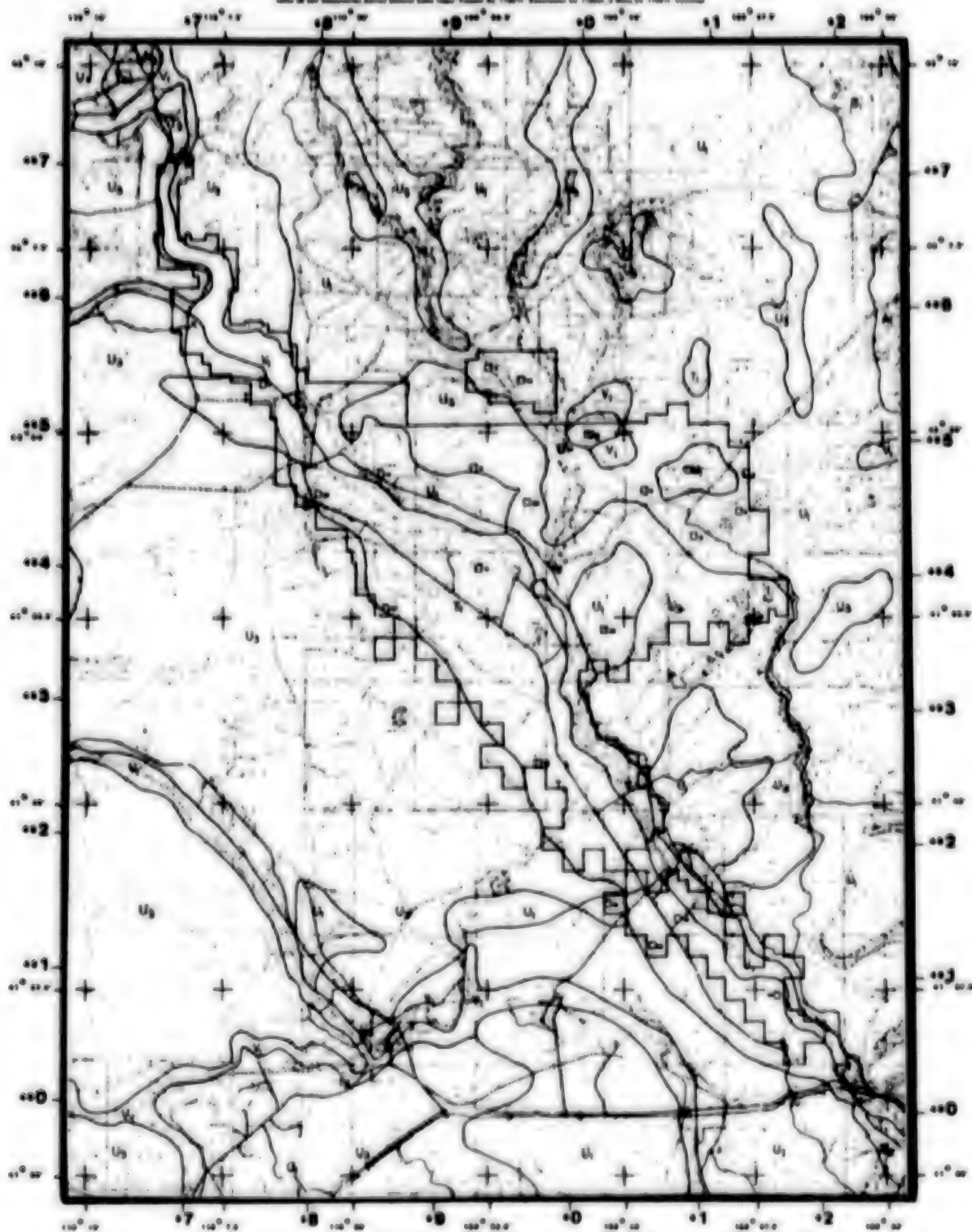


Figure 5-4

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

SCALE MAP

UNITED STATES GEOLOGICAL SURVEY, BUREAU OF LAND MANAGEMENT, DENVER, COLORADO 80225



SEEDSKADEE PROJECT AREA BOUNDARIES AND SURVEY BLOCK LOCATIONS

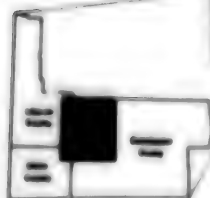


34

SCALE
0 1 2 3 4 5 6 7 8 9 10
MILES

ONE INCH = ONE MILE (Scale)

This map was prepared by the Bureau of Land Management, Denver, Colorado, under contract to the U.S. Department of the Interior, Bureau of Land Management.



Legend
 Project Area Boundary
 Survey Block Boundary
 Contour Line
 Road
 River
 Lake
 Mountain Peak
 Elevation
 Cultural Resource Site
 Cultural Resource Site Name
 Cultural Resource Site Description
 Cultural Resource Site Coordinates
 Cultural Resource Site Date
 Cultural Resource Site Status
 Cultural Resource Site Notes
 Cultural Resource Site Comments
 Cultural Resource Site References
 Cultural Resource Site Sources
 Cultural Resource Site Contacts
 Cultural Resource Site Owners
 Cultural Resource Site Managers
 Cultural Resource Site Staff
 Cultural Resource Site Volunteers
 Cultural Resource Site Partners
 Cultural Resource Site Stakeholders
 Cultural Resource Site Interests
 Cultural Resource Site Values
 Cultural Resource Site Goals
 Cultural Resource Site Objectives
 Cultural Resource Site Strategies
 Cultural Resource Site Tactics
 Cultural Resource Site Actions
 Cultural Resource Site Outcomes
 Cultural Resource Site Impacts
 Cultural Resource Site Benefits
 Cultural Resource Site Risks
 Cultural Resource Site Challenges
 Cultural Resource Site Opportunities
 Cultural Resource Site Threats
 Cultural Resource Site Constraints
 Cultural Resource Site Assumptions
 Cultural Resource Site Uncertainties
 Cultural Resource Site Unknowns
 Cultural Resource Site Questions
 Cultural Resource Site Answers
 Cultural Resource Site Conclusions
 Cultural Resource Site Recommendations
 Cultural Resource Site Suggestions
 Cultural Resource Site Ideas
 Cultural Resource Site Concepts
 Cultural Resource Site Theories
 Cultural Resource Site Models
 Cultural Resource Site Frameworks
 Cultural Resource Site Structures
 Cultural Resource Site Systems
 Cultural Resource Site Processes
 Cultural Resource Site Mechanisms
 Cultural Resource Site Functions
 Cultural Resource Site Operations
 Cultural Resource Site Activities
 Cultural Resource Site Programs
 Cultural Resource Site Projects
 Cultural Resource Site Initiatives
 Cultural Resource Site Campaigns
 Cultural Resource Site Movements
 Cultural Resource Site Organizations
 Cultural Resource Site Institutions
 Cultural Resource Site Communities
 Cultural Resource Site Networks
 Cultural Resource Site Groups
 Cultural Resource Site Teams
 Cultural Resource Site Committees
 Cultural Resource Site Councils
 Cultural Resource Site Boards
 Cultural Resource Site Commissions
 Cultural Resource Site Authorities
 Cultural Resource Site Agencies
 Cultural Resource Site Departments
 Cultural Resource Site Divisions
 Cultural Resource Site Offices
 Cultural Resource Site Centers
 Cultural Resource Site Institutes
 Cultural Resource Site Foundations
 Cultural Resource Site Endowments
 Cultural Resource Site Trusts
 Cultural Resource Site Estates
 Cultural Resource Site Properties
 Cultural Resource Site Assets
 Cultural Resource Site Liabilities
 Cultural Resource Site Equity
 Cultural Resource Site Debt
 Cultural Resource Site Capital
 Cultural Resource Site Revenue
 Cultural Resource Site Expenses
 Cultural Resource Site Income
 Cultural Resource Site Costs
 Cultural Resource Site Profits
 Cultural Resource Site Losses
 Cultural Resource Site Gains
 Cultural Resource Site Investments
 Cultural Resource Site Returns
 Cultural Resource Site Yields
 Cultural Resource Site Dividends
 Cultural Resource Site Payouts
 Cultural Resource Site Bonuses
 Cultural Resource Site Commissions
 Cultural Resource Site Salaries
 Cultural Resource Site Wages
 Cultural Resource Site Fees
 Cultural Resource Site Charges
 Cultural Resource Site Taxes
 Cultural Resource Site Duties
 Cultural Resource Site Obligations
 Cultural Resource Site Responsibilities
 Cultural Resource Site Roles
 Cultural Resource Site Positions
 Cultural Resource Site Titles
 Cultural Resource Site Ranks
 Cultural Resource Site Grades
 Cultural Resource Site Levels
 Cultural Resource Site Stages
 Cultural Resource Site Phases
 Cultural Resource Site Steps
 Cultural Resource Site Tasks
 Cultural Resource Site Jobs
 Cultural Resource Site Careers
 Cultural Resource Site Occupations
 Cultural Resource Site Professions
 Cultural Resource Site Vocations
 Cultural Resource Site Occupations
 Cultural Resource Site Professions
 Cultural Resource Site Vocations
 Cultural Resource Site Occupations
 Cultural Resource Site Professions
 Cultural Resource Site Vocations

A Cultural History of the SEEDSKADEE Region

by

Arthur K. Ireland

The Seedskadee region lies at the interface of at least two, and possibly three, cultural sequences which probably represent very different ways of living. The first is that of the northern Great Plains, generally thought of as the big game hunters from the Paleo-Indian period up through the early Historic period. That gathering and farming may also have been part of that way of life is often overlooked. The second is that of the Great Basin, the desert hunter-and-gatherer traditions. The third is generally overlooked entirely, that of the Inter-mountain/Plateau area, which probably represented a combination of the first two ways of life. This review will look at each prehistoric cultural/regional sequence separately, then describe briefly the Historic occupation of the area, and finally comment on the surveys which have previously been done in the Seedskadee region. As Frison and Grey (1980:27) note, "The presence of ... cultural groups in the archeological record is known mostly from distinctive and identifiable projectile point types," this discussion will follow the typological sequences of the projectile points found in each region. The majority of the projectile point types mentioned here can be found in Appendix XIII. The illustrations used within this text, with one exception, were found during the 1983 Seedskadee Project survey.

PLAINS SEQUENCES (Figure 6-1)

PALEO-INDIAN PERIOD (??-8,000 B.P.)

pre-Clovis (??-12,000 B.P.)

It has yet to be demonstrated to all archeologists' satisfaction that people were present in the New World prior to the Clovis period, although it has been suspected for years. Krieger (1964) was one of the earlier and more vocal proponents of an earlier group. His pre-projectile point stage (1964:42-51) is of some interest here because Krieger (1964:42-43) included Renaud's (1938, 1940) Black Fork Culture in his pre-projectile point stage. Three of Renaud's sites were recorded less than 16 km southwest of the Seedskadee project area. However, since these sites lacked diagnostic artifacts, they could well have dated much later than Clovis times. Frison (1978:27) notes that several Plains sites, for example, the Colby mammoth site and the Union Pacific Mammoth site, and a few cave sites, such as Little Box Elder Cave, Bell Cave, and Horned Owl Cave in Wyoming and Jaguar Cave and Wilson Butte Cave in Idaho, have deposits suggestive of the pre-Clovis period but either lack reliable dates or cultural materials. Frison (1978:27) also alludes to a possible pre-Clovis site on the plains in northeastern Colorado being investigated by Dennis Stanford. This is probably the Dutton-Selby site which Stanford described in a talk at the University of New Mexico's Sigma Xi Chapter's 1984 annual banquet. At this site, there are at least two levels below those bearing Clovis materials. The levels are dated but there are no diagnostic materials present.

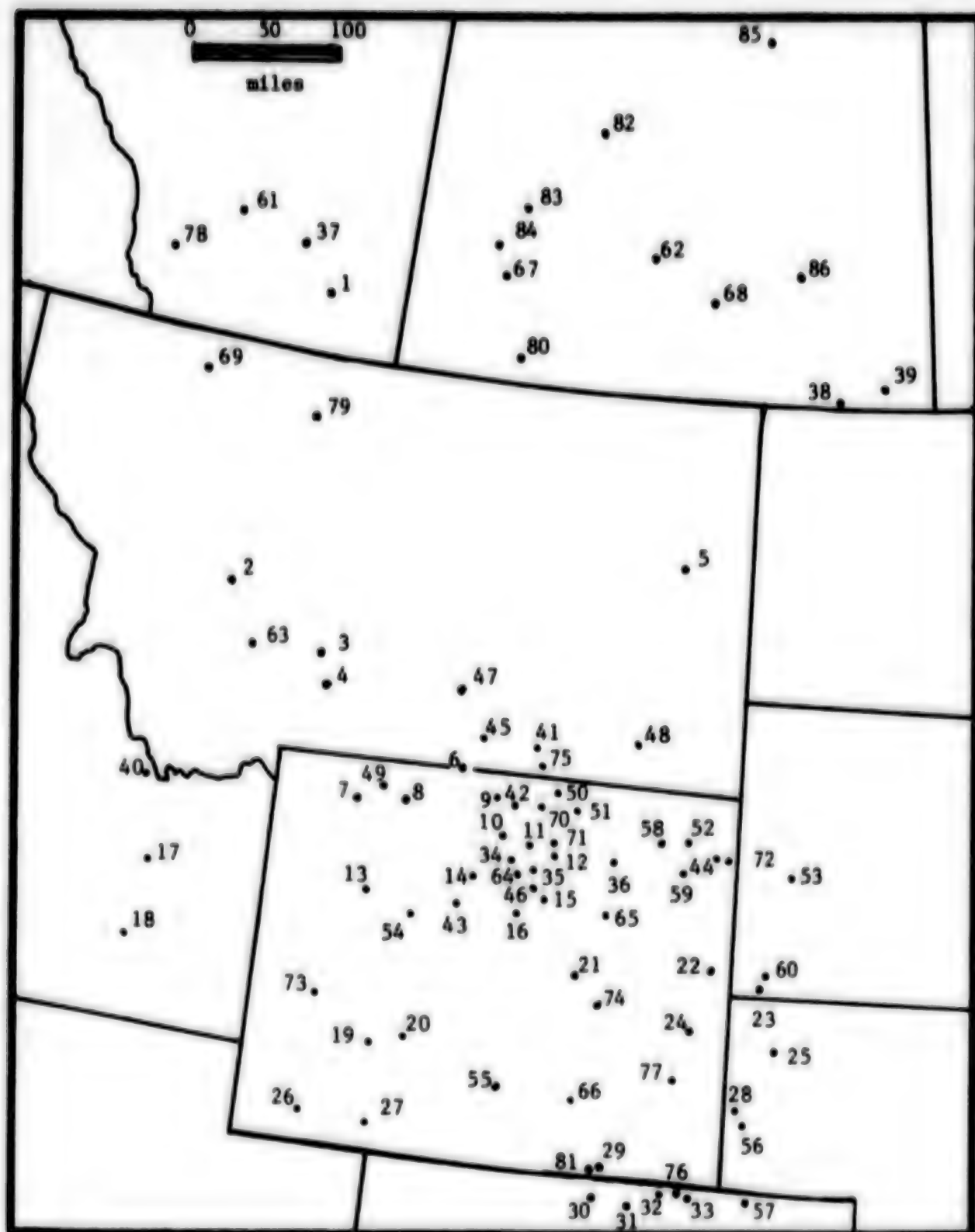


Figure 6-1. Plains sites (after Kehoe and McCorquodale 1961: 180--Fig. 10; Frison 1978: 28--Fig. 2.1, 42--Fig. 2.6, 48--Fig. 2.7, 57--Fig. 2.10, and 63--Fig. 2.12).

KEY TO SITES IN FIGURE 6-1.

- | | |
|---|---------------------------------|
| 1. Fletcher | 44. Hawken |
| 2. MacHaffie | 45. Pretty Creek |
| 3. Anzick | 46. Leigh Cave |
| 4. Myers-Hindman | 47. Pictograph Cave |
| 5. Lindsay Mammoth | 48. Powers-Yonkee |
| 6. Bighorn Canyon Sites (24CB202,
24CB221, and 24BH206) | 49. Dead Indian Creek |
| 7. Mummy Cave | 50. Mavrakis-Benson-Roberts |
| 8. Horner | 51. Powder River |
| 9. Hanson | 52. McKean |
| 10. Medicine Lodge Creek | 53. Gant |
| 11. Paint Rock V | 54. Birdshead Cave |
| 12. Sister's Hill | 55. Scoggin |
| 13. Lookingbill | 56. Signal Butte |
| 14. Colby | 57. Dipper Gap |
| 15. Schiffer Cave | 58. Belle Rockshelter |
| 16. 48JO303 | 59. Mule Creek Rockshelter |
| 17. Wasden | 60. Kolterman |
| 18. Haskett | 61. Old Women's Buffalo Jump |
| 19. Killpecker Dune Field (includ-
ing Eden-Parson and Finley) | 62. Mortlach and Besant |
| 20. Morgan | 63. Schmitt |
| 21. Casper | 64. Daugherty Cave |
| 22. Agate Basin | 65. Ruby |
| 23. Ray Long | 66. Muddy Creek |
| 24. Hell Gap | 67. Gull Lake |
| 25. Hudson-Meng | 68. Avonlea |
| 26. Pine Spring | 69. Boarding School |
| 27. Mud Springs | 70. Big Goose Creek |
| 28. Scottsbluff Bison Quarry | 71. Piney Creek |
| 29. James Allen | 72. Vore Buffalo Jump |
| 30. Lindenmeier | 73. Wardell |
| 31. Dent | 74. Glenrock Buffalo Jump |
| 32. Jones-Miller | 75. Foss-Thomas |
| 33. Betty Greene | 76. Happy Hollow |
| 34. Laddie Creek | 77. Grey Rock Reservoir |
| 35. Southsider Cave | 78. McLean |
| 36. Carter-McGee | 79. Rinehardt Bison Drive |
| 37. Head-Smashed-In Buffalo Jump | 80. Bakken-Wright Bison Drive |
| 38. Long Creek | 81. Willow Springs Buffalo Trap |
| 39. Oxbow Dam | 82. Ardath |
| 40. Birch Creek | 83. Kyle |
| 41. Kobold | 84. Verle |
| 42. Granite Creek Rockshelter | 85. Klein |
| 43. Wedding of the Waters Cave | 86. Cherry Lake |

Clovis Complex (12,000-11,000 B.P.)

The diagnostic of the Clovis period sites is the large (6-16 cm long) fluted projectile point found on these sites (see Appendix XIII, pp. 2, 8, and 13). The flutes were generally produced by removing several flakes and usually extended only about halfway up the point (Wormington 1957:263). Usually the edges of the base show grinding. A number of sites with probable Clovis components have been reported by Frison (1978: 27-29). Most were in eastern Wyoming: the Colby mammoth site (Frison 1978:86-110) and the Union Pacific Mammoth site (McGrew 1961); in Montana: the Anzick site (Lahren and Bonnicksen 1974) and the Lindsay Mammoth site (Davis 1971); in Idaho: the Simon site (Butler 1963); and in Colorado: the Dent site (Figgins 1933; Wormington 1957; Zier and Peebles 1982). While many archeologists find it difficult to accept the Colby Clovis points as true Clovis points, it has been noted that similar points were found in the Clovis levels at the Dent site in Colorado. Of more pertinency to the Seedskaadee Project were isolated finds of Clovis points in the Red Desert, northeast of the project area, and in the Upper Green River Valley (Frison 1978:27; Zier and Peebles 1982:20).

Goshen Complex (11,000-10,800 B.P.)

Frison (1978:30) reported finding a single site on the western side of the Bighorn Mountains with fluted projectile points that appeared to be technologically transitional between Clovis and Folsom. These and a number of other isolated finds in Wyoming seem to fall into what Irwin-Williams and others (1974) have called the Goshen Complex. Unfortunately, no stratigraphic or datable locations have been found to confirm or deny the existence of this intermediate group.

Folsom Complex

The Folsom Complex may have two diagnostic projectile point types, one fluted-- the Folsom (see Appendix XIII, pp. 2, 8, and 13), and one unfluted-- the Midland (see Appendix XIII, pp. 2 and 13). The Folsom is a smaller point than the Clovis (2-8 cm long) although there is some overlap in size and the Folsom is thinner. The points have a deeply concave base marked by distinctive ears and a small central nipple in the concavity from which the channel flakes were struck to form the flute which usually extends the length of the point (Wormington 1957:263). The Midland point resembles the Folsom closely in shape, size, and flaking techniques but lacks the flute and is even thinner than the Folsom (Wormington 1957:263).



Figure 6-2.
Folsom Preform
(actual size)
Seedskaadee Project
1983 Survey

Folsom Fluted (11,000-10,500 B.P.)

Folsom sites are considerably more common than either Clovis or Goshen Complex sites. Relatively few have been well-dated. Among those which Frison (1978) reported as having good dates are the Lindenmeier site in Colorado (Roberts 1935, 1936) and the Brewster site at the Agate Basin site locality (Agogino 1972) and the Hanson site (Frison 1978:115-146) in

Wyoming. Undated sites include the MacHaffie site in Montana (Forbis and Sperry 1952) and the Turk site and the stratified Wyoming sites of Hell Gap (Irwin-Williams and others 1973), Carter-McGee (Frison 1978), and the Union Pacific mammoth site (Frison 1978; Ziemens and Walker 1977a, 1977b). Three other undated Folsom sites of importance to the present study are the Mud Springs site north of Rock Springs and the Morgan site south of Rock Springs (Frison 1978:31; Zier and Peebles 1982) and the Meadow Draw #10 site (Metcalf 1976; Zier and Peebles 1982).

Midland (10,700-10,400 B.P.)

The Hanson site and the Hell Gap site also contained another projectile point type related to the Folsom point, the Midland. Many archeologists feel that these are the same as Folsoms but, for whatever reasons, were not fluted. Several isolated finds of Midland points, however, also suggest the possibility of a separate complex (Frison 1978:31).

Agate Basin (10,500-10,000 B.P.)

The diagnostic projectile point of this period is a generally well-crafted, long, slender point (see Appendix XIII, pp. 2 and 13). Unlike the previous periods, which seemed to target on mammoth hunting, the Agate Basin sites seem to represent bison hunters. According to Frison (1978:31-32), Agate Basin is the best represented of the Paleo-Indian complexes at the Hell Gap site. Besides the Agate Basin levels at the Hell Gap Site (Irwin-Williams and others 1973), there are Agate Basin levels at the Brewster site in the Agate Basin site locality (Frison 1978:32) and mixed with Hell Gap materials at the Carter-McGee site (Frison 1978:32). Projectile points similar to the Agate Basin points have been found in Occupation I at the stratified Pine Spring site (Sharrock 1966; Frison 1978; Zier and Peebles 1982) southwest of the Seedskaadee region and in levels at Mummy Cave, at the Medicine Lodge Creek sites, and in Bighorn Canyon (Frison 1978:32). Isolated Agate Basin points have been found in various locations in Wyoming as well (Frison 1978:32).

Hell Gap (10,000-9,500 B.P.)

The Hell Gap point appears similar to the Agate Basin point but is broader and has a square base rather than a round one (see Appendix XIII, pg. 3). Frison (1978:168) reports that the Hell Gap Complex is the best documented on the bases of the work done at two sites, the Casper site (Frison 1974b) in Wyoming and the Jones-Miller site (Stanford 1974) in northeastern Colorado. Other Wyoming sites where Hell Gap materials have been found include the Hell Gap site itself (Irwin-Williams and others 1973; Frison 1978), Sister's Hill site (Agogino and Galloway 1965; Ziemens and Walker 1977a, 1977b), and 48SW637 (Walker and others 1975; Zier and Peebles 1982).

Plainview (10,000-9,000 B.P.)

The Plainview point is a type best known from the southern Great Plains (see Appendix XIII, pp. 3 and 13). It has a concave base, parallel-transverse flaking, and straight edges that converge near the tip (Frison 1978:40). Frison reported one found at the Medicine Lodge Creek site.



Figure 6-3.
Plainview Point
(actual size)
Seedskaadee Project
1983 Survey

Alberta (9,500-9,000 B.P.)

The Alberta point is similar to the later Edens and Scottsbluff I points but larger and broader than them (see Appendix XIII, pp. 3 and 13). Bison hunting still seems to be an important activity at this time as most of the Alberta sites are kill sites. Important Alberta sites include the Hell Gap site (Irwin-Williams and others 1973), the Hudson-Meng site in Nebraska (Agenbroad 1973; Frison 1978), and the Olsen-Chubbock site in Colorado (Wheat 1972, 1974, 1978). Isolated finds of Alberta points were made near Red Deer and Edmonton in Alberta (Wormington 1957) and, more importantly for this study, near La Barge, Wyoming (Reynolds 1983), and the Fontenelle Dam (Frison 1978).

Cody Complex (9,000-8,500 B.P.)

The Cody Complex has four diagnostic artifacts: the Eden point, the Scottsbluff point--varieties I and II, and the Cody Knife (see Appendix XIII, pp. 2 and 13). The Eden point is a long (2-12 cm), slender (0.9-2 cm), slightly stemmed projectile point, the stemming possibly being the result of pronounced basal grinding (Wormington 1957:267). This point has a diamond-shaped cross-section and transverse-parallel flaking. The Scottsbluff I point has either a somewhat triangular-shaped or a parallel-sided blade with small shoulders and a broad stem. It is broader (2-3 cm) in relation to its length (5-16 cm) than the Eden, has a more oval cross-section, and generally has transverse-parallel flaking which is often more irregular than the Eden's (Wormington 1957:267). Wormington (1957:267) described the Scottsbluff II point as having "wider triangular blades, are thin and lenticular in cross-section, and have more clearly defined shoulders." The Cody Knife is characterized as having transverse blades that are usually shouldered on one side but sometimes having a parallel-sided base with no inset (Wormington 1957:267). Flaking is fine and the artifact is thin and smooth (Jennings 1974:118). In Colorado, the Cody Complex is represented at the Claypool site (Dick and Mountain 1960). In Wyoming, Cody Complex materials have been found at the Hell Gap site (Irwin-Williams and others 1973, Frison 1978), 48CA12 (Ziemens 1975,



Figure 6-4.
Cody Knife
(actual size)
Seedskaadee Project
1983 Survey

Ziemens and Walker 1977a, 1977b), the Medicine Lodge Creek site (Frison 1975, 1978; Frison and Walker 1975), the Laddie Creek site (Ziemens and Walker 1977a, 1977b), the Black Butte area (Metcalf 1975), the Horner site (Frison 1978), the Carter-McGee site (Frison 1978), the Finley site (Moss and others 1951; Frison 1978), Occupation I at the Pine Spring site (Sharrock 1966; Zier and Peebles 1982), and the Larson Cache (Frison 1978; Zier and Peebles 1982). Eden points were found at the Horner site, the Carter-McGee site, the Finley site, and Occupation I at the Pine Springs site. Scottsbluff I points were also found at the Horner site, the Carter-McGee site, and Occupation I at the Pine Springs site. Scottsbluff II points were found at the Larson Cache and the Finley site.

TERMINAL PALEO-INDIAN (10,000-7,000 B.P.)

Parallel-Oblique Flaked Projectile Point Complexes

There are a number of complexes with parallel-oblique flaked projectile points which date to the terminal period of the Paleo-Indian time span (see Appendix XIII, pg. 4).

Angostura (9,000-7,000 B.P.)

This is a poorly documented and perhaps invalid classification. The point diagnostic of this period or complex is described as being slender lanceolate points with either slightly concave bases or irregularly straight. The flaking consists of obliquely-parallel ripple scars of usually length and the cross-section is lenticular (Wormington 1957:268). Only the Ray Long site in South Dakota has been described in the literature (Hughes 1949; Wormington 1957; Jennings 1974; Frison 1978), although Wormington (1957:138) does say that there is a site in Wyoming with similar well-flaked points. Unfortunately, she does not specify which site that is.

James (Jimmy) Allen (8,400-7,500 B.P.)

This point has a lanceolate form with a deeply indented base, is very thin, and has a lenticular cross-section (Wormington 1957:146). It is of moderate size, generally ranging from 7 to 12 cm in length (see Appendix XIII, pg. 4), although one was reported to be as small as 4 cm (Wormington 1957:46). Most of the known Jimmy Allen points have been found on the James Allen site in Wyoming (Wormington 1957:144-146; Mulloy 1959; Frison 1978), but at least one was reported from near Kansas City, Missouri (Wormington 1957:146). Another Jimmy Allen point of relevance to this study was a surface find in North Baxter Basin, east of Rock Springs, Wyoming (Treat 1978; Zier and Peebles 1982).

Frederick Complex (8,400-8,000 B.P.)

This is a complex which Irwin-Williams and others (1973:50-51) view as being closely related to the Jimmy Allen materials. The only difference which they see is that the base on the Jimmy Allen point is more deeply indented. The Frederick materials are known primarily from the Hell Gap site (Irwin-Williams and others 1973; Frison 1978).

Lusk Complex (8,000-7,500 B.P.)

Frison (1978:34) sees this complex as being a degenerate form of the Frederick Complex, found at two sites-- the Hell Gap site (Irwin-Williams and others 1973) and the Greene site (Greene 1967).

Earlier Mountain-Foothill Lanceolate Complexes (9,600-9,000 B.P.)

Round Base

A single dated example of this type was found in a level at the Medicine Lodge Creek site which dated 9,600 B.P. (Frison 1978:40) and Frison states that the type is quite common in that area as surface finds. The point has a broad triangular blade, parallel-sided stem, and a rounded base (see Appendix XIII, pg. 4).

Split Base

Another level at the Medicine Lodge Creek site dating 9,510 B.P. $\pm$ 260 years (Frison 1978:40) produced a different type of point which has nearly straight edges with wide, shallow lateral indentations near the base and a split or indented base (see Appendix XIII, pg. 4). The lateral indentations and base are heavily ground. A similar point was found in a level at Southsider Cave with a similar date (Frison 1978:40). Unfortunately, the context is being questioned.

Later Mountain-Foothill Lanceolate Complexes (8,500-8,000 B.P.)

Pryor Stemmed Complex

This is a stemmed lanceolate point, the edges of which show steep alternate beveling which is so varied that the cross-sections range from rhomboid to rectangular (Frison and Grey 1980:29). The stems often show beveling opposite to that of the blade and the base is concave. Heavy grinding is present in the hafting areas. This complex has been found on a number of sites in southern Montana: near Pryor Mountain (Husted 1969; Frison 1978) and Occupation III of the Sorenson (24CB202) site (Husted 1969; Frison 1978) and northern Wyoming: the Schiffer Cave (48JO319) site (Frison 1973a, 1978), the Medicine Lodge Creek (48BH499) site (Frison 1976a, 1978), Occupation III of the Bottleneck Cave (48BH206) site (Husted 1969; Frison 1978), the bottom levels of the Paint Rock V (48BH349) site (Frison 1976a, 1978), 48JO303 (Haynes and others 1966; Frison 1978), the Granite Rockshelter (48BH330) site (Frison and Grey 1980), the Hanson Pryor Stemmed (48BH178) site (Frison and Grey 1980), the White Butte (48WA82) site (Frison and Grey 1980), the Company Springs (48WA7) site (Frison and Grey (1980), the Scotch Corrals (48JO701) site (Frison and Grey 1980), and near Kaycee (Frison 1973; Ziemens and Walker 1977a, 1977b).

Lovell Constricted Complex

Frison (1978:37) describes this type as being a lanceolate point that was crudely flaked in a parallel-oblique manner and having concave bases and slightly restricted edges which give the impression of being stemmed (see Appendix XIII, pg. 4). They have been found in Occupation I in Bottleneck Cave (Husted 1969; Frison 1978), in Occupation II at the Sorenson site (Husted 1969; Frison 1978), at Medicine Lodge Creek (Frison 1976a, 1978), and at Mummy Cave (Frison 1978).

Unnamed Lanceolate I

The points in this category show a resemblance to the Pryor Stemmed (see Appendix XIII, pg. 4) but lack the characteristic beveling on the edges (Frison 1978:38). Points of this type have been found in Schiffer Cave (IMACS April 1983) and at the Medicine Lodge Creek site (Frison 1978).

Unnamed Lanceolate II

Both the Medicine Lodge Creek site (Frison 1978) and Southsider Cave (Frison 1978) have produced a second type of lanceolate point which have either a rounded base or an only very slightly concave base (see Appendix XIII, pg. 4). Frison (1978:38) dates them to around 8,500 B.P. and states that they are similar to some points found at Mummy Cave.

McKean-like Lanceolate

This point resembles the later McKean Lanceolate in outline (see Appendix XIII, pg. 4) but the edges were ground in the Paleo-Indian style (Frison 1978:40). This type of projectile point was found in a level at Southsider Cave which dated to 8,500 B.P. and below a level at the Medicine Lodge Creek site which dated to the same time period (Frison 1978:40).

EARLY PLAINS ARCHAIC (7,500-5,000 B.P.)

Frison (1978:41) characterizes the change from the Paleo-Indian period to the Early Plains Archaic as an "abrupt change in projectile point styles from the lanceolate ... types to the side-notched ... types." There are also corner-notched types as well, but apparently fewer in number. This period is not well documented, partially because of the lack of recognition of this period's sites due to the similarity of its material culture to the succeeding Middle and Late Archaic periods (Zier and Peebles 1982:22). The majority of the Early

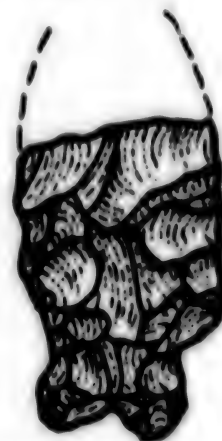


Figure 6-5.
Lanceolate I Point
(actual size)
Seedskaadee Project
1983 Survey



Figure 6-6.
Lanceolate II Points
(actual size)
Seedskaadee Project
1983 Survey

Plains Archaic sites seem to occur in the foothills and mountain areas but this may be a function of the Early Plains Archaic sites in the Plains just not being correctly interpreted as such (Zier and Peebles 1982:22). Buffalo hunting appears to remain important and the animals probably were often trapped in arroyos or box canyons, as they had been during the Paleo-Indian period.

Early Plains Archaic Corner-notched

Some large corner-notched points, some with and others without basal notches (see Appendix XIII, pg. 4), were found at Southsider Cave (Frison 1978), at Wedding of the Waters Cave (Frison 1962, 1978), in cultural level 16 at Mummy Cave (Frison 1978), in strata assigned to the Early Plains Archaic at Laddie Creek (Frison 1978), and in gravels dated between terminal Paleo-Indian and Middle Plains Archaic at the Medicine Lodge Creek Site (Frison 1978:46). Frison (1978:46) adds a note of caution, however, when he reports that projectile points found in cultural level 24 (terminal Early Plains Archaic) at Mummy Cave included points, which, if taken out of context, could easily be mistaken for Late Plains Archaic.

Early Plains Archaic Side-notched

Frison (1978:41) notes that change in projectile point types is very abrupt from the Paleo-Indian period to the Early Plains Archaic going from the lanceolate form to a large side-notched point. Several named and unnamed types have been found (see Appendix XIII, pg. 4), Pahaska Side-notched, Blackwater Side-notched, Hawken Side-notched, and others.

Blackwater Side-notched

These points have been reported in cultural level 16 at Mummy Cave (Frison 1978).

Pahaska Side-notched

At least five points of this type were found in cultural level 16, 17 in level 18, and more in levels 17 and 19 at Mummy Cave (Frison 1978), plus one other which may represent an Early Archaic component at the Pretty Creek site at Pryor Gap in south central Montana (unpublished; Frison 1978).

Hawken Side-notched

These points (see Appendix XIII, pg. 4) were reported at the Hawken site (Frison 1978) and possibly at Southsider Cave (Frison 1978).

General Side-notched

A number of sites are reported to have Early Plains Archaic components: the Pretty Creek site (unpublished; Frison 1978), the Sorenson site (Husted 1969; Frison 1978), and the Myers-Hindman site (Lahren 1976; Frison 1978) in Montana and the Lookingbill site, Mummy Cave (Wedel and others 1968; Frison 1978), Granite Creek Rockshelter (Frison 1978), Wedding of the Waters Cave (Frison 1962, 1978), Laddie Creek (Frison 1978), the Paint Rock V site

(Frison 1968), Leigh Cave (Frison and Huesas 1968; Frison 1978), Rice Cave (Frison 1978), Carter Cave (Frison 1978), Spanish Point Quarry (Frison 1978), the Hawken site (Frison 1978), and the Hawken III site (Frison 1978).

Oxbow Complex

This complex seems to overlap the Early and Middle Plains Archaic (Frison 1978:45) and is best known on the northern Great Plains at the Oxbow Dam site (Nero and McCorquodale 1958; Frison 1978) and the Long Creek site (Wettlaufer and Mayer-Oakes 1960; Frison 1978) in Saskatchewan and the Castor site (Wormington and Forbis 1965; Frison 1978) and the Head-Smashed-In Buffalo Jump (Reeves 1973; Frison 1978) in Alberta. There may have been some mixing of cultural materials at Mummy Cave, Rice Cave and Southsider Cave and possibly at Dead Indian Creek (Smith 1970; Frison 1978).

MIDDLE PLAINS ARCHAIC (5,000-2,500 B.P.)

The proliferation of Middle Plains Archaic sites would seem almost incredible if the probability of misinterpretation of some preceding period's sites had not occurred. Still, it appears that Middle Archaic peoples were moving out onto the Plains and into intermontane basin areas (Frison 1978:46). These people were apparently also becoming increasingly dependent upon plant foods. Diagnostics of this time period include not only projectile points, but also flat sandstone grinding slabs and sandstone manos and large numbers of roasting pits (Frison 1978:47) and stone circles (Frison 1978:51-53). New techniques for taking buffalo, jumps and corrals, appear to have been developed or used more extensively.

McKean Techno-complex

This complex contained at least four types (see Appendix XIII, pg. 5): Duncan, Hanna, McKean Lanceolate, and Mallory Side-notched, and several variants-- an Oxbow-like variant of the Hanna and a Southsider variant of the McKean Lanceolate.

McKean Lanceolate

This lanceolate form had an indented base and convex blade edges which were slightly wider in the middle than at the base. The point was of medium size (4-8 cm long and about 2 cm wide). The Southsider variant had slight lateral restrictions which were not quite deep enough to qualify it as a side-notched point. McKean points have been reported from the Myers-Hindman site (Lahren 1976; Frison 1978) and the Sorenson site (Husted 1969; Frison 1978) in Montana, the Dipper Gap site (Metcalf 1973; Frison 1978) in Colorado, the Signal Butte site (Strong 1935 as cited in Frison 1978) in Nebraska, the Gant site (Gant and Hurt 1965; Frison 1978) and the Kolterman site (Wheeler n.d.; Frison 1978) in South Dakota, and the Dead Indian site (Smith 1970; Frison 1978), the McKean site (Mulloy 1954b; Ziemens and Walker 1977a, 1977b), the Scoggin site (Frison and others 1974; Frison 1978), Granite Creek Rockshelter (Frison and Walker

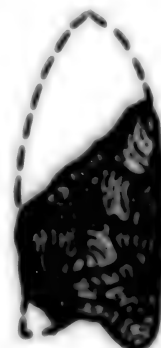


Figure 6-7.
McKean Lanceolate
Point (actual size)
Seedskaadee Project
1983 Survey

1975; Frison 1978), Mummy Cave (Wedel and others 1968; Frison 1978), the Medicine Lodge Creek site (Frison 1978), the Paint Rock V site (Frison 1978), Leigh Cave (Frison and Huseas 1968; Frison 1978), and 48JD303 (Haynes and others 1966; Frison 1978). The Southsider variant has been found at the Dead Indian Creek site (Smith 1970; Frison 1978), at the McKean site (Mulloy 1954b), and at Southsider Cave (Frison 1978).

Duncan

Frison (1978:50) sees this projectile point plus the Hanna point, and the Mallory point as merely variants of the McKean Lanceolate. The Duncan point differs from the McKean Lanceolate in that it is a stemmed point with sloping shoulders. It was reported from one site in South Dakota-- 39FA10 (Wheeler 1954b), and four sites in Wyoming-- the Buffalo Creek site (Ziemens and Walker 1977a, 1977b), the Powder River site (Frison 1978), the Mule Creek site (Wheeler 1954a; Jennings 1974; Frison 1978), and 48CK13 (Jennings 1974).

Hanna

Like the Duncan, this is a stemmed projectile point, but with distinct shoulders and a slightly expanding base. This point type has been found in Nebraska at the Signal Butte site (Wheeler 1954b; Jennings 1974), and in Wyoming at the Belle Rockshelter (Wheeler 1954b; Jennings 1974), the Powder River site (Frison 1978), the Mule Creek site (Wheeler 1954b), and the Dead Indian site (Smith 1970; Frison 1978). An Oxbow-like variant was reported from the Cascade Creek site (Breckenridge 1974).

Mallory Side-notched

Frison (1978:50) describes this point as being wide and very thin, having deep side notches well up the edges, and having either straight, concave, or deeply indented bases. These deep indentations sometimes take the form of a deep, narrow basal notch. The Mallory Side-notched points have been found on the Signal Butte site in Nebraska (Frison 1978) and the McKean (Ziemens and Walker 1977a, 1977b) and the Scoggin (Frison 1978; Frison and others 1974) sites in Wyoming.

Yonkee

There is some question whether the people using the Yonkee projectile point were the same as those using the McKean Complex materials. If they were not, then they were in the same areas at the same time as the McKean people (Frison 1978:50). These points were long (5-8 cm), side-notched, or, occasionally, corner-notched, and had either deep basal indentations or basal notches. They have been found in arroyo bison kills and buffalo jump sites such as the Powers-Yonkee site (Bentzen 1961; Frison and others 1974) and the Kobold site (Frison 1970b, 1978) in Montana and the Powder River site (Frison 1968c,



Figure 6-8.
Mallory Side-notched
Points (actual size)
Seedskaadee Project
1983 Survey

1978), the Mavrakis-Bentzen-Roberts site (Bentzen 1962; Frison and others 1974; Frison 1978), and 485H312 (Frison 1978) in Wyoming.

LATE PLAINS ARCHAIC (3,500-1,400 B.P.)

During the Late Plains Archaic (or Late Middle Prehistoric, as it is also known) Period, there again is a radical shift in projectile point types, away from the side-notched so predominant in the Middle Archaic to true corner-notched--the Pelican Lake and Besant points (see Appendix XIII, pg. 6). Some side-notched points do continue to be used and triangular points begin to appear (Frison 1978). The people using the Besant points also developed sophisticated methods for taking buffalo, such as building post-and-rail corrals to trap small groups of bison (Frison 1971a, 1978:58). The number of ritual structures associated with such corrals may be indicative of the degree of importance these people attached to buffalo procurement (Zier and Peebles 1982:24).



Figure 6-9.
Yonkee Point
(actual size)
Seedskaadee Project
1983 Survey

Pelican Lake (3,100-1,850 B.P.)

This is a true corner-notched projectile point, the notches of which form sharp points where they intersect the blade edge and base side and the blade edges and point bases may be either slightly concave or straight (Frison 1978:58). Pelican Lake points have been reported from the Mortlach site (Wettlaufer 1955; Frison 1978) and the Long Creek site (Wettlaufer and Mayer-Oakes 1960; Frison 1978) in Saskatchewan, the Head-Smashed-In Buffalo Jump (Reeves 1974; Frison 1978) in Alberta, the Schmitt site (Davis 1973; Frison 1978), and the Medicine Lodge Creek site (Frison and Walker 1975; Siemens and Walker 1977a, 1977b; Frison 1978), and Mummy Cave (Frison 1978).

Besant (1,940-1,400 B.P.)

While the Pelican Lake point was a medium-sized point, the Besant, although dating later, seems to be a throwback, resembling to a degree the Early Plains Archaic Hawken projectile point. The Besant was a large (2-9 cm long and 1-5 cm wide), usually side-notched, and had a short, broad stem, concave or straight base, and concave blade edges. This point was found on the Mortlach site (Wettlaufer 1955; Frison 1978) in Saskatchewan and at the Ruby site (Frison 1971a, 1978) and the Muddy Creek site (unpublished; Frison 1978) in Wyoming. It was during the Besant period that the corral traps appeared to have become most elaborate.

General Late Plains Archaic

Other than the Besant and Pelican Lake points, Late Plains Archaic projectile points fall into generic categories: Large Corner-notched, Small Corner-notched, Large Side-notched, Large Side-notched/basally-notched, and Triangular. The first is the most commonly reported type with Zier and Peebles (1982) reporting them on the Wyoming sites: 48LN864, 48UT605,

48UT610, 48UT612, 48UT628, and isolated finds in the BLM's Kemmerer Resource Area; Ahlbrandt (1974) listing them at Wyoming's Killpecker Dune Field sites: #1, #3, #4, #5, #6, #7, #8, and #9; various reporters recording them on other Wyoming sites: Spring Creek Cave (Frison 1965, 1978), Daugherty Cave (Frison 1968c, 1978), Wedding of the Waters Cave (Frison 1962, 1978), Occupation V of Bottleneck Cave (Husted 1969; Frison 1978), Rabbit Bone Cave (Stuckenrath and Mielke 1972; Frison 1978), and the Montana site of Kobold (Frison 1970b, 1978). A small corner-notched point was also reported from lower Level III at Wedding of the Waters Cave (Frison 1962, 1978). Large side-notched points were found at 48LN851 (Zier and Peebles 1982), the Killpecker Dune Field sites #1 and #3 (Ahlbrandt 1974), and upper Level III at Wedding of the Waters Cave (Frison 1962, 1978). A large side-notched/basally-notched point was also recorded in Level II at Wedding of the Waters Cave (Frison 1962, 1978). A relatively large triangular point came from lower Level III at Wedding of the Waters Cave (Frison 1962, 1978).



Figure 6-10.
Late Plains Archaic
Corner-notched Points
(actual size)
Seedskadee Project
1983 Survey

LATE PLAINS PREHISTORIC-EARLY PLAINS HISTORIC

Some major changes occurred in the Late Prehistoric period. There is a reduction in projectile point size as a result of the shift from the use of the atlatl and dart to the bow and arrow, crude pottery begins to appear, and it becomes possible to recognize Shoshonean and Crow cultural groups (Zier and Peebles 1982:25). That bison hunting remained important in many areas is evidenced by the number of buffalo jump kill sites known. In the mountain areas, however, there is more evidence of reliance on small game rather than bison and in southwestern Wyoming the reliance was placed more on communal antelope kills (Zier and Peebles 1982). Gathering vegetal foods remained major activities as evidenced by the flat grinding stones and manos found on sites from this period. Also diagnostic of the period are the grooved maul and the bison metatarsal flesher (Frison 1978:69). Projectile point types fall into three major categories: side-notched, corner-notched, and triangular.

Avonlea (1,900-1,370 B.P.)

Kahoe and McCorquodale (1961:179) describe the small, triangular, side-notched points found throughout the northern Great Plains as "ubiquitous". They defined one variety, the Avonlea (see Appendix XIII, pp. 7, 19), as a horizon marker for the northern Great Plains.



Figure 6-11.
Avonlea Point
(actual size)
Seedskadee Project
1983 Survey

Kehoe and McCorquodale (1961:184) as being distinguished by its "delicate aspect." The flaking is extremely well-done, scars are very broad and shallow and usually parallel. The side notches are small, shallow, and fairly wide and are very low on the blade, so low, in some cases, as to present the appearance of corner notches instead of side notches. The edges of the blade are very regular and may be finely serrated (Kehoe and McCorquodale 1961:184). The bases have rounded corners, are usually concave but may be straight, and are usually lightly ground. The length ranges from 1.2 cm to 3.8 cm and width from 0.9 cm to 1.9 cm (Kehoe and McCorquodale 1961:184). Kehoe and McCorquodale (1961) reported Avonlea points have been found in Montana: the Rinehardt Bison Drive (Hughes 1948), in Alberta: the MacLean site, and in Saskatchewan: the Avonlea site, the Bakken-Wright Bison Drive, the Ardath site (Wettlaufer 1951), the Kyle site (Wettlaufer 1951), the Verle site (Wettlaufer 1951), the Chamberlain site (Wettlaufer 1951), the Long Creek site (Wettlaufer and others 1960), the Klein site, the Cherry Lake site, and the Gull Lake Bison Drive. Other investigators reported Avonlea points in Montana: the Sorenson site (Husted 1969; Frison 1978), the Bill Greene site (Husted 1969; Frison 1978), and the Mangus site (Husted 1969; Frison 1978); and in Wyoming: Killpecker Dune Field Site #9 (Ahlbrandt 1974), Willow Springs Buffalo Trap (Frison 1978), and the Beehive site (Ziemens and Walker 1977a, 1977b).

Prairie Side-notched (1,380-600 B.P.)

Kehoe (1967), on the basis of the 440 projectile points found at the Boarding School Bison Drive site in Montana and Forbis' previous work (1962), identified and described a number of varieties or sub-types of both the Prairie and Plains Side-notched points. Kehoe (1967:44-45) described the general form of the Prairie Side-notched as having a "comparatively irregular outline and poorly-defined angles"; convex to straight but never concave sides tapering toward the tip and base; large, wide, shallow V- or U-shaped side notches located low on the blade; and a base usually narrower than the proximal end of the blade and most often straight. Lengths varied from 1.4 cm to 3.3 cm and widths from 1.0 cm to 1.7 cm. This type, Kehoe (1967:49) is more often found in the northern section of the Great Plains and he posits a possible connection with the Pisamiks ceramic tradition.

Irvine Square-narrow Base

This projectile point (see Appendix XIII, pg. 7) is similar to some of the later Plains Side-notched but is classed as a Prairie Side-notched since its base is narrower than the proximal end of the blade and its side notches are usually wide, shallow, and low on the blade (Kehoe 1967:45). Besides being present on the Boarding School Bison Drive site, Frison illustrates several projectile points from the Wardell site (Frison 1973b, 1978:225) and the Glenrock Buffalo Jump site (Frison 1977a, 1978:225) which appear to fit into this sub-type.

Lewis Narrow Rounded Base

Kehoe (1967:45) reported that "superficially these points appear to be corner-notched, but ... the base has definite lateral edges indicating side-notching." The base may be straight, rounded, convex, but rarely concave, and is less wide than the proximal end of the blade. Eight specimens were recorded at the Boarding School site.

Tompkins Side Corner-notched

Only one of these points occurred at the Boarding School site. Its size is somewhat smaller than the other sub-types of the Prairie Side-notched points. Its straight, ground base was the same width as the blade. On one side of the specimen the notch is very wide and shallow, forming a corner notch while the notch on the other side is a true side notch.

Plains Side-notched (600-200 B.P.)

This type of projectile point Kehoe (1967:42-43) sees as having a well-defined outline, a sharp, angular base and notches, and convex to nearly straight blade edges which are seldom serrated. The side notches are placed higher on the blade than on the Prairie Side-notched points, are small but deep, and the angles on the corners of the notches and the base are either square or form acute angles. Kehoe (1961:49) sees this type as being concentrated more in the southern portions of the Plains area and suggests a possible association with Mississippian-influenced people.

Nanton Wide Rounded Base

This form (see Appendix XIII, pg. 7) is seen by Kehoe (1961:46) as being transitional between the Prairie and the Plains Side-notched points. Kehoe discusses this variety with Prairie Side-notched but classes it with the Plains Side-notched because the base is generally as wide or wider than the proximal end of the blade and the notches usually have a wide V- or U-shape. The notches are a medium distance above the base, which is normally straight, and basal and notch corners are rounded. Eighteen points of this sub-type were recorded at the Boarding School site and Frison (1973a, 1978:225) illustrates what appears to be another one at the Wardell site.

Paskapou Square-ground Base

This point has a squarish appearance, caused by the straight base which is equal in width to the width of the proximal end of the blade. The base is usually heavily ground. The side notches are high on the blade, large but shallow, and round (Kehoe 1967:43). Some 38 of these points were found at the Boarding School site.

Pekiako Concave-base V-notched

Again, the basal width of this point is equal to or greater than the width of the proximal end of the blade (Kehoe 1967:44). The base is usually concave but may be straight, although never convex. Its lateral edges slope down and inward, giving the base and outline which Kehoe (1967:43) describes as a "wide "U". The side notch is large, V-shaped, and high up the blade. More than 60 of these points were found at the Boarding School site.

Washita Triangular

This point has the form of an isosceles triangle with a flaring base which

is wider than the proximal end of the blade (see Appendix XIII, pg. 7). The base is seldom ground and is usually concave. The side notches are high on the blade, at right angles to the blade, deep and narrow, and rectangular in shape (Kehoe 1967:44). In addition to the 65 specimens reported for the Boarding School site, specimens from the Glenrock Buffalo Jump (Frison 1970a, 1978:225), the Big Goose Creek site (Frison 1967a), and the Wardell site (Frison 1973b, 1978:225) have been illustrated.

Cut Bank Jaw-notched

The side notches are the distinctive feature of this otherwise Washita Triangular point. They are round and are narrower toward the blade edges (Kehoe 1967:44). Only three examples of this sub-type were found on the Boarding School site.

Buffalo Gap Single-spur

According to Kehoe (1961:44), this variety is identical to the Washita Triangular variety except that one corner of the base is lengthened to form a distinct spur. Ten points of this sub-type were found on the Boarding School site.

Billings Double Spur, Basal-notched

This appears closely related to the Emigrant Basal-notched point (described below). The major differences are that this point is much smaller than the Emigrant Basal-notched and the base is concave while still retaining the small notch in its center. This notch is V- or U-shaped, however. One specimen was reported from Level IVa and two from Level IVb of Wadding of the Waters Cave (Frison 1962).

Emigrant Basal-notched

This sub-type is also referred to as the Parson Tri-notched variety (IMACS 1983) or Desert Side-notched, Sierra variety (see Appendix XIII, pp. 7, 11, and 19). The base is usually, although not always, wider than the proximal end of the blade and the base is straight with small rectangular notch in its center. The side notches are high up on the blade, rectangular, and often larger than the basal notch. The edges of the blade may be convex or straight. Sites with this sub-type may include the Vore Buffalo Jump (Frison 1978; Reher and Frison n.d.) and the Piney Creek site (Frison 1967b, 1978).



Figure 6-12.
Washita Triangular variety
(actual size)
Seedsadee Project
1983 Survey



Figure 6-13.
Buffalo Gap
Single-spur variety
(actual size)
Seedsadee Project
1983 Survey



Figure 6-14.
Emigrant Basal-notched variety
(actual size)
Seedsadee Project
1983 Survey

non-specific Plains Side-notched

Three sites, the Foss-Thomas site (Fry 1971) in Montana and the Vore Buffalo Jump (Reher and Frison n.d.) and the Glenrock Buffalo Jump (Frison 1970a) and have been cited (Frison 1978) as having Plains Side-notched materials but no specific details were given and none had any points illustrated.

Wapiti Corner-notched (1,200-400 B.P.)

This type is a rather distinctive corner-notched point which is long and narrow and has serrated edges (Frison 1978:71). It was reported from cultural level 36 at Mummy Cave.

Unnamed Complex (1,400 B.P. plus or minus)

This complex was found in the mountains and foothills of northwestern Wyoming and southwestern Montana. It consists of campsites on butte tops and along the rims of deep canyons. The faunal remains on these is considerably more than that found on Late Archaic sites (Frison 1978:71). The projectile points found on these sites are small, thin, and delicately flaked and show a number of different notching styles (see Appendix XIII, pg. 7).

Undifferentiated Corner-notched

This type can be sub-divided into small (under 2.5 cm in length), medium (1.8-3.2 cm in length), large (over 2.5 cm in length), and, in at least one case, skinny (see Appendix XIII, pg. 7). The more general sub-divisions are relatively common throughout Wyoming. Small corner-notched points have been reported by Ahlbrandt (1974) on the Killpecker Dune Field site, #7; by Zier and Peebles (1982) on 48LN854, 48UT619, and a surface find; and by Frison (1978) with burials in or near the Bighorn Mountains. Zier and Peebles (1982) also reported medium or large corner-notched points on 48UT606 and 48UT610, as did Frison (1978) on 48CR310, Ahlbrandt (1974) also on Killpecker Dune Field site #7, and Frison (1978) and Frison and Walker (1975) at the Medicine Lodge Creek site and at the Granite Creek Rockshelter. The skinny corner-point was reported by Ahlbrandt (1974) on Killpecker Dune Field site #9.



Figure 6-13.
Late Prehistoric Corner-notched Points
(actual size)
Seedskaadee Project
1983 Survey

Undifferentiated Side-notched

These points are not as common and appear generally to be small (see Appendix XIII, pg. 7). Ahlbrandt (1974) reports them from the Killpecker Dune Field sites, #1 and #6. Other Wyoming sites upon which these points have been found include the Lee site (Randall 1963), which dates about 1,000 B.P. (Frison 1978:61,70); 48PL29 (Mulloy and Steege 1967), which dates 1,025 B.P. $\pm$ 150 years (Frison 1978:61); and 48CR310 (unpublished, Frison 1978:61), which dates 780 B.P. $\pm$ 110 years; and the Montana site of Myers-Hindman (Lahren 1976), which dates 800 B.P. (Frison 1978:70).

Triangular

This type has not received a specific name on the Plains but in the Great Basin and Intermountain areas it probably would be classified as Cottonwood Triangular (see Appendix XIII, pp. 7, 11, and 19). On the Plains the type is separated by the terms (undefined): small and large. One small triangular point was found in Level IVb of Wedding of the Waters Cave (Frison 1962). One large triangular point was found on Killpecker Dune Field site #9 (Ahlbrandt 1974) and another was recorded at the Vore site (Reher and Frison n.d.; Frison 1978).

Ceramic sites

As was noted above, ceramics are diagnostic of this period. The ceramics are divided into the prehistoric Upper Republican, Shoshonean, Crow, and Fremont. The Fremont, a Great Basin development, will be discussed in the next section of this report. Jennings (1974:274) reported the Upper Republican as being the antecedents in the Nebraska area of the Lower Loup focus, which is seen as being the archeological remains of the historic Pawnees. The Upper Republican culture is believed to have had its bases in the Woodland and Mississippian cultures of the Middle and Lower Missouri River areas. The Shoshonean, or Intermountain Tradition, pottery had a flat bottom and a flower-pot shape, was thick and poorly fired, and contained widely-varying sizes of ungraded temper (Frison 1978:64-65). Also commonly found with the Shoshonean pottery vessels were vessels of similar shape but carved from steatite. Crow, or Mandan Tradition, pottery appears more globular in shape, with a rounded base and an outwardly-curving, tall lower body, high shoulder; short, rapidly in-curving upper body; and a short, slightly out-curving neck. Other Woodland pottery found on the Plains also had a rounded bottom but the sides curved so slightly in relation to the height of the vessel that a shoulder, upper, and lower bodies are difficult to distinguish. The orifice of these vessels is only slightly smaller than or equal to the widest diameter of the vessel.



Figure 6-16.
Triangular Points
(actual size)
Seedskaadee Project
1983 Survey

Upper Republican

The Happy Hollow Rockshelter is reported (Steege 1967; Frison 1978) to have both Upper Republican and Woodland ceramics in association with small corner-notched points. This site has been dated to around 1,300 B.P. (Frison 1978:71).

Crow

Frison (1978:67) states that sites which can produce adequate samples of this type of ceramics for positive identification are rare. He further reports that Crow pottery has been recovered from sites along the Yellowstone River in Montana (Mulloy 1942, 1953, 1958) and in northwestern South Dakota (Over 1936). Other Crow sites in Wyoming for which there are dates include: the Big Goose Creek site--400-500 B.P. (Frison 1967a, 1978:70), the Piney Creek site--300-400 B.P. (Frison 1967b, 1978:70), and the Medicine Lodge Creek site--around 200 B.P. (Frison and Wilson 1975; Frison 1978:70). Also found on these sites were both side-notched and side-notched, basally-notched projectile points.

Shoshonean

Side-notched and side-notched, basally-notched points were also found on Shoshonean sites which have been dated. Mummy Cave has been dated 370 B.P. + 90 years in a level with Shoshonean pottery (Frison 1978:71) and the Eden-Parson site to 230 B.P. + years 100 (Frison 1971b; 1978:71). Other sites with Shoshonean pottery reported are the Eagle Creek site in Wyoming (Arthur 1966) and the Myers-Hindman site in Montana (Lahren 1976).

Woodland

Only a few sites have been reported with Woodland pottery. As previously noted, Happy Hollow Rockshelter in Colorado (Steege 1967; Frison 1978) contained this pottery type, as did the Wyoming sites at the Grey Rocks Reservoir (Ziemens and Walker 1977a, 1977b), and perhaps 48LA325 at the Lumis Ranch (Ziemens and others n.d.), which had levels with possibly Woodland dating about 1,100 B.P. (Frison 1978:71).

Other Pottery Types

Pueblo

Both corrugated and painted pottery types have been found along the North Platte River in southern Wyoming (Frison 1978:67).

Fremont

This type will be discussed more in the next section. Frison (1978:67) notes that it has been only discovered as surface finds along the Green River in southwestern Wyoming.

Dismal River

Occasional sherds in the southeastern portion of Wyoming show Dismal River characteristics but their identification as such is open to question (Frison 1978:69).

Promontory

The presence of this pottery type in Wyoming remains questionable (Frison 1978:69).

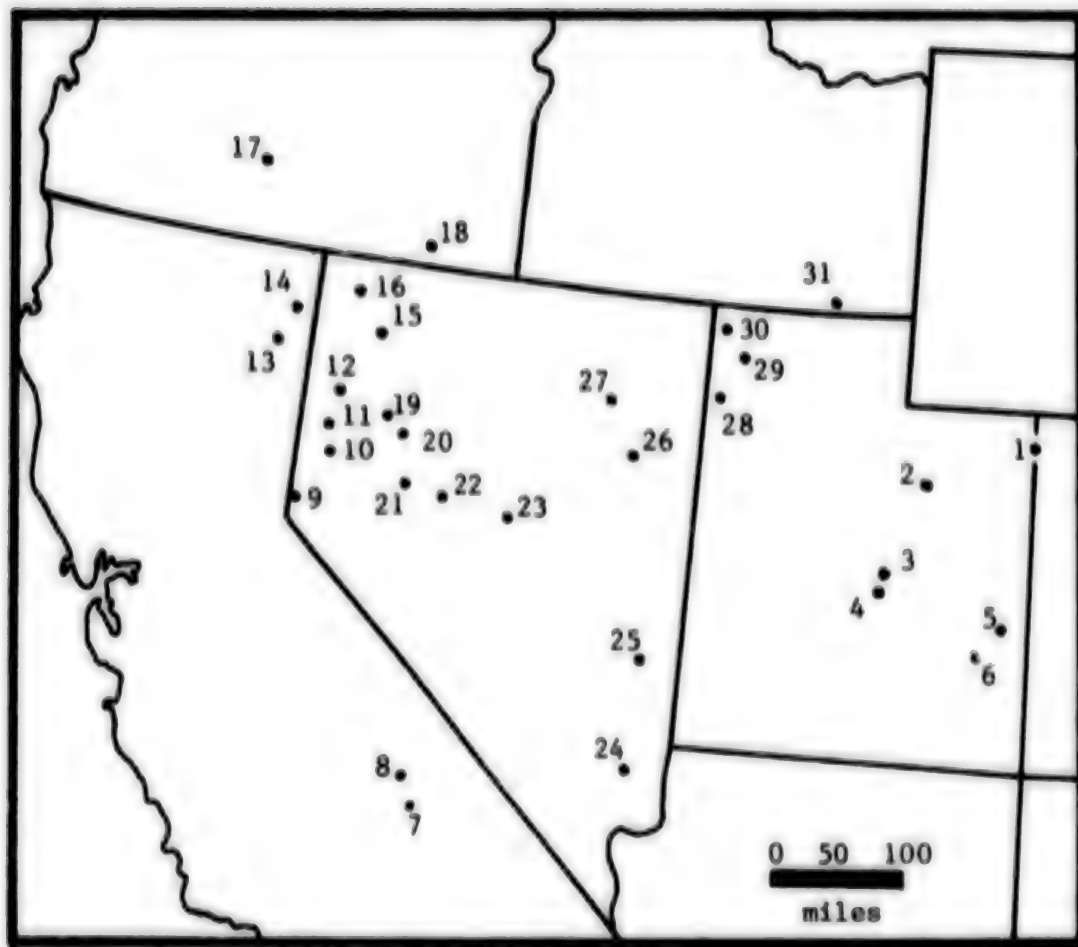
GREAT BASIN SEQUENCES (Figure 6-17)

Prior to 14,000 B.P., the Great Basin appears to have had a much wetter environment than it does today. Almost 70 lakes have been identified there for that period (Jennings 1974:66), the largest being Lake Bonneville, which covered much of western Utah, and Lake Lahontan, which covered a large part of western Nevada. Conditions appear to have begun to become progressive drier after 14,000 B.P. and, by 12,000 B.P., the plants and animals of the Great Basin were much the same as they are today, despite small fluctuations in the climate such as the minor late ice age advances. Jennings (1974:67) feels that the effects of these minor ice age advances have been over-exaggerated in their importance in changing the ecosystems of the Great Basin. If so, then the Great Basin has been far more desertic in nature for the last 13,000-12,000 years than has the Great Plains which was far better watered with its thousands of springs, streams, bogs, and ponds. The grasslands of the Great Plains could be expected to have supported large populations of megafauna, where the Great Basin could not. As a result, the pattern of human life, as seen in the archeological record, could also be expected to differ from that of the Great Plains. If the megafauna of the Plains did not intrude into the Great Basin in great numbers, and apparently they did not, then the big-game hunters of the Paleo-Indian period would not be expected to have exploited the region to any large extent. Instead, what would be expected is evidence of a lifeway which exploited the plants and smaller animals (smaller in relation to the megafauna) such as deer, antelope, rabbits, and birds. This appears to have been the case. Paleo-Indian remains are few in the Great Basin and poorly documented. Archaic hunting and gathering seems far more prevalent and much better documented. This lifeway, in contrast to the Great Plains sequences, continued into the Historic period. Figure 6-17 shows the locations for most of the sites mentioned in this section.

PALEO-INDIAN PERIOD (12,000-8,000 B.P.)

Clovis (12,000-11,000 B.P.)

Since the general description of the Clovis complex has already been given (pg. 62, this chapter, and see Appendix XIII, pp. 1, 8, and 13), it does not need to be repeated here. Very few Clovis sites are known for the Great Basin. One Clovis point was reported found on the terraces of Pleistocene Lake Accord, near Emory, Utah (Tripp 1966). A second appeared described by Crouse (1954) in the literature as a Folsom point found near Duchesne, Utah. Crouse also noted that several fragments of "Yuma" type points had previously been found in the same area (1954:51). Why the point Crouse



- | | |
|---|--|
| 1. Dinosaur Nat'l Mon. (incl. Deluge Shelter & the Lowell site) | 16. Hanging Rock Shelter |
| 2. Duchesne | 17. Fort Rock Valley (incl. Connley Caves, Fort Rock Cave, & Cougar Mountain Cave) |
| 3. Ferron | 18. Coyote Flat |
| 4. Emery | 19. Hesterlee (NV Pe 67) |
| 5. Moab | 20. NV Ch 15 & Lovelock Cave |
| 6. junction of the Green and Colorado Rivers | 21. Hidden Cave |
| 7. Stahl (Little Lake) site | 22. Wagon Jack Shelter |
| 8. Rose Spring | 23. Gatecliff Shelter |
| 9. Spooner Lake & Thompson sites | 24. Stuart Rockshelter |
| 10. Shaman's Burial (NV Wa 1016) | 25. O'Malley & Conway Shelters |
| 11. NV Wa 355 | 26. Newark Cave |
| 12. Kramer Cave | 27. South Fork Rockshelter |
| 13. Karlo | 28. Danger Cave |
| 14. Surprise Valley (incl. Rodriguez & King's Dog sites) | 29. Hogup Cave |
| 15. Black Rock Desert | 30. Swallow Shelter |
| | 31. Weston Canyon Rockshelter |

Figure 6-17. Great Basin Sites (after Heizer and Hester 1978: 43--Fig. 9; Crouse 1945; Gunnerson 1956; Hunt and Tanner 1960; Tripp 1966).

described was identified as being a Folsom remains unclear, but it is suspected because so few Clovis and Folsom points had been found and fewer illustrations and descriptions existed in the literature, that such a misinterpretation was possible.

Folsom (11,000-10,500 B.P.)

Like the Clovis complex, the Folsom has already been described (pp. 62-63, this chapter, and see Appendix XIII, pp. 1, 8, and 1) and need not be redescribed here. Also, like the Clovis points, few Folsom complex materials are known for the Great Basin. Gunnerson (1936) reported one Folsom point at the Silverhorn (42RMA) site in Utah. This was a rockshelter in a canyon. A quarter-mile downstream was evidence of a floodplain lake which may have backed up, on occasion, to the cave. Hunt and Tanner (1960) recorded a site northwest of Moab, Utah, which contained several Folsom points and reported one Folsom being found by a collector north of that site, two south of the site, and one near the confluence of the Green and Colorado Rivers (1960:111).

Danger Cave Lanceolate (10,300 B.P.)

This projectile point was a long, slender, lanceolate point (see Appendix XIII, pg. 8) which was found on the Sand 1 component of Layer 1 at Danger Cave (UT), as were 6 small hearths (Jennings 1978:32).

Cody Complex (9,000-8,500 B.P.)

Scottsbluff

The lowest levels of Deluge Shelter, located in Dinosaur National Monument on the Colorado/Utah border, yielded a single Scottsbluff point (Leach 1970; Zier and Peebles 1982:21).

TERMINAL PALEO-INDIAN/ARCHAIC (10,000-500 B.P.)

In the Great Basin, the transition from Paleo-Indian to Archaic is very subtle. This may be due to the paucity of Paleo-Indian sites known in the Great Basin, but is probably also due a less distinct difference between the tool kits and ways of life ascribed to the two periods in the Great Basin. Three major series of projectile points existed in the Great Basin for a long period of time and at approximately the same time. The Elko-Bitterroot series (see Appendix XIII, pp. 8-9, 14-15) may have lasted the longest, from at least 8,350 B.P. to the protohistoric period (Heizer and Hester 1978:7). The Pinto Basin Series (see Appendix XIII, pp. 9-10, 17) apparently dates from 6,000 B.P. to 3,000 B.P. (Heizer and Hester 1978; Jennings 1978). The Black Rock-Humboldt Series (see Appendix XIII, pp. 10-11, 16) dates possibly as early as 7,350 B.P. (Heizer and Hester 1978:2) to 3,000 B.P. Zier and Peebles (1982:21) see similarities in flaking on the Humboldt sub-series points with some of the terminal Paleo-Indian obliquely-flaked lanceolate points of the northwestern Great Plains.

Elko-Bitterroot Series (10,000-500 B.P.)

Nearly a dozen sites in the Great Basin contained Elko projectile points in datable contexts (Heizer and Hester 1978:6-7); California sites--Rodriguez

(2,150 B.P. $\pm$ 100 years), Rose Spring (2,240 B.P. $\pm$ 145 years, 2,900 B.P. $\pm$ 90 years), and Karlo (2,350 B.P.); Nevada sites: O'Malley Shelter (870 B.P. $\pm$ 100 years, 890 B.P. $\pm$ 100 years, 2,970 B.P. $\pm$ 100 years, and 3,940 B.P. $\pm$ 120 years), Gatecliff Shelter (1,580 B.P. $\pm$ 90 years, 1,670 B.P. $\pm$ 80 years, 2,280 B.P. $\pm$ 90 years, 3,140 B.P. $\pm$ 120 years, 3,690 B.P. $\pm$ 100 years), Shashan's Burial [NV-WA-1016] (1,820 B.P. $\pm$ 180 years), Conway Shelter (1,980 B.P. $\pm$ 110 years, 2,050 B.P. $\pm$ 110 years, 2,090 B.P. $\pm$ 110 years), Wagon Jack Shelter (2,930 B.P. $\pm$ 200 years), Hidden Cave (3,050 B.P. $\pm$ 200 years), and South Fork Shelter (3,320 B.P. $\pm$ 200 years); and Utah: Swallow Shelter (2,360 B.P. $\pm$ 110 years) and Hogup Cave (8,350-600 B.P.).

Elko Corner-notched

This projectile point type (see Appendix XIII, pp. 8 and 18) has an equilateral to slightly elongate triangular blade with straight to slightly excurvate edges, a parallel-sided or expanding stem with straight to slightly convex base, and corner-notches which form down-raking tanga (Fowler 1968b:8-10). However, the tanga may be almost missing, giving the point a shouldered appearance (Aikens 1970:35). It is considered by some (Aikens 1970:35) to be temporally non-diagnostic, since it was found in strata 3 (7,950 B.P.) through 14 (600 B.P.) at Hogup Cave in Utah (Heizer and Hester 1978:7) and may occur even earlier at Fort Rock, Oregon (Heizer and Hester 1978:5). Such points have been found on the Nevada sites of: NV El 15 (Heizer and Hester 1978), Newark Cave (Fowler 1968b), Wagon Jack Shelter (Heizer and Baumhoff 1961), and as isolates and on some sites found during the northeastern Nevada survey (Fowler 1968a): 26EK303, 26EK322, 26EK404, 26EK410, 26EK423, 26EK424, 26WP108, 26WP133, and 26EU101, and at Hogup Cave (Aikens 1970; Jennings 1978) in Utah, among others.

Elko Eared

This type of point likewise has a triangular blade which is equilateral to elongate in shape and has edges which may be serrated and are straight or excurvate; corner or side notches which form down-raking tanga and an expanding stem whose base is concave and has distinctive "ears" (Fowler 1968b:10; Aikens 1970:36). Elko eared points (see Appendix XIII, pp. 9 and 18) have been found in strata 1 (8,350 B.P.) through 8 (3,200 B.P.) at Hogup Cave in Utah (Heizer and Hester 1978:7) and at the Nevada sites of Newark Cave (Fowler 1968b), NV Ch 15 (Heizer and Hester 1978), Wagon Jack Shelter (Heizer and Baumhoff 1961), and some sites found during the northeastern Nevada survey (Fowler 1968a): 26EK304, 26EK305, 26EK322, 26EK330, 26EK410, 26EK413, 26EK421, 26EK423, 26EK424, 26EU102, 26WP104, 26WP109, 26WP113, 26WP121, 26WP124, and 26WP125.

Elko Split-stem

This point type (see Appendix XIII, pg. 8) also has a triangular blade, slender to medium in relation to its length, with edges which are straight or convex and may or may not be serrated; with either corner or side notches and straight or "drooping" tanga; and stems which are either parallel-sided or slightly expanding and bifurcated by a basal notch (Aikens 1970:36). It can be differentiated from the Elko Eared by its narrower stem and more slender blade form (Aikens 1970:36). Examples of this type have been found in Hogup Cave in Utah (Aikens 1970; Jennings 1978).

Elko Contracting-stem

This point type (see Appendix XIII, pp. 8 and 18) has a broad triangular blade with convex sides and deep, often asymmetrical, corner or basal notches which form a narrow, constricting base (Fowler 1968b:17). It has been reported for some Nevada sites: Wagon Jack Shelter (Heizer and Baumhoff 1961) and 26WP104, found in the northeastern Nevada survey (Fowler 1968a).

Elko Side-notched

This point (see Appendix XIII, pg. 8) has a relatively short triangular blade which tapers quickly from a broad base to a point (Aikens 1970:36). The blade edges may be straight or convex. This point has been reported in Hogup Cave in Utah (Aikens 1970; Jennings 1978).

Bitterroot (Northern) Side-notched

Very common in the northern portion of the Great Basin, this point type (see Appendix XIII, pp. 9, 14, and 15) is often found associated with Elko points. It has a triangular blade of medium width in relation to its length; blade edges which are either straight or convex and may be serrated; side notches; and a bottom on the base which is usually concave. It can be distinguished from the Elko side-notched point by the concave base bottom, narrower side notches, and generally better workmanship (Aikens 1970:36-39). Good dates (Heizer and Hester 1978:13) for Bitterroot points were obtained from California's Surprise Valley sites--Rodriguez and King's Dog (6,950-3,250 B.P.) and Weston Rockshelter in Idaho (7,200-3,250 B.P.). The points were also found in Hogup Cave in Utah (Aikens 1970; Jennings 1978) and at various sites found during the surveys on the east side of the Black Rock Desert in Nevada (Heizer and Hester 1978).

Pinto Basin Series (6,000-2,750 B.P.)

Like the Elko-Bitterroot series, this series is a long-lived one. The time span of this series may be even greater than given above, as Jennings (1978:59, 62) says Pinto Basin points were found in Layers II (9,750 B.P.) through V (5,950 B.P.) in Danger Cave, Utah, and in Layers I (8,350 B.P.) through 8 (3,200 B.P.) in Hogup Cave, Utah. Other dated sites containing Pinto Basin projectile points include (Heizer and Hester 1978:4-5): in California, the Rodriguez site (2,650 B.P. $\pm$ 80 years); in Utah, Swallow Shelter (2,630 B.P. $\pm$ 110 years); and in Nevada, Kramer Cave (3,830 B.P. $\pm$ 110 years), Stuart Rockshelter (3,870 B.P. $\pm$ 250 years, 4,050 B.P.), South Fork Rockshelter (4,310 B.P. $\pm$ 40 years), the Spooner site (4,920 B.P. $\pm$ 120 years), Hanging Rock Shelter (5,300 B.P. $\pm$ 380 years).

Pinto Basin Barbed

This stemmed point (see Appendix XIII, pp. 9 and 17) has a triangular blade which is very short and broad in relation to its length; a broad stem, the base of which is indented and may have basal notches; and well-marked shoulders which give the appearance of barbs (Aikens 1970:39). This type has been found in California at the Stahl (Little Lake) site (Heizer and Hester 1978), in Utah in Hogup Cave (Aikens 1970; Jennings 1978), and in Nevada at Newark Cave (Fowler 1968b), Tule Springs (Wormington 1957), and on various sites located during a survey of the east side of the Black Rock

Desert (Heizer and Hester 1978). The Pinto Basin Barbed point can be distinguished from the other Pinto Basin points by its distinctive basal form (Aikens 1970:39).

Pinto Basin Willow-leaf

This type of point (see Appendix XIII, pp. 9 and 17) was described by Aikens (1970:39) as being a leaf-shaped point which is slender in relation to its length, having a base which is straight or rounded, and having ragged, irregular edges. The crude flaking and thickness are considered signs of poor workmanship. Aikens (1970) and Jennings (1978) report this type as being present in Hogup Cave in Utah.

Pinto Basin Shoulderless

The Pinto Basin Shoulderless (see Appendix XIII, pp. 9 and 17) is a small, thick and broad, lanceolate blade with a deeply indented base (Aikens 1970:40). Like the Willow-leaf form, it has been reported at Hogup Cave in Utah (Aikens 1970; Jennings 1978).

Pinto Basin Square-shoulder

Aikens (1970:39) describes this point being stemmed, triangular, and ranging from slender to broad in relation to its length. The blade may have straight or convex edges. The stem is broad in relation to length of the entire point and is parallel-sided or slightly expanding. The shoulders, which are cut square or sloping slightly upward, are pronounced. The base is indented and may have basal notches. There is slight resemblance of the base to that of the Humboldt Concave Base point (Aikens 1970:39). This point type (see Appendix XIII, pp. 9 and 17) has been found on the Stahl (Little Lake) site in California (Heizer and Hester 1978), in Hogup Cave in Utah (Aikens 1970; Jennings 1978), and on the Nevada sites of Tule Springs (Wormington 1957) and NV Ch 15 (Heizer and Hester 1978).

Pinto Basin Sloping-shoulder

This point (see Appendix XIII, pp. 10 and 17) has a thick, lanceolate blade with convex edges; a stem which expands toward the base; and a base which is concave, giving it a slightly "eared" look (Aikens 1970:39-40). This type is the most commonly reported of the Pinto Basin series, being found on the Stahl (Little Lake) site in California (Heizer and Hester 1978), at Hogup Cave in Utah (Aikens 1970; Jennings 1978), and on two sites found on the northeast Nevada survey (Fowler 1968a): 26EK314 and 26WP102, and other Nevada sites including Tule Springs (Wormington 1957), NV Ch 15 (Heizer and Hester 1978), Hidden Cave (Heizer and Hester 1978), Newark Cave (Fowler 1968b), and various sites found during a survey of the east side of the Black Rock Desert (Heizer and Hester 1978).

Black Rock-Humboldt Series (5,000-3,000 B.P.)

Aikens (1970:51) states the two sub-series in this series, Black Rock and Humboldt, are grouped together because both are lanceolate points with concave bases which occur together stratigraphically, at least in Hogup and Danger Caves in Utah, suggesting historical and cultural ties between these

two sub-series. In Hogup Cave, the Black Rock sub-series occurs in strata 6-9 and Humboldt in strata 9-10, while at Danger Cave both are found in levels II-V (Aikens 1970:51).

Black Rock Concave-base

This point (see Appendix XIII, pp. 10 and 16) is a lanceolate form whose width is medium in relation to its length, whose blade edges are convex, and whose base is concave and may be constricted but is never shouldered (Aikens 1970:40). Aikens (1970:40) reports that the Black Rock Concave-base may be distinguished from the Humboldt Concave-base (see below) by the Black Rock's greater length, greater width in relation to its length, lack of shouldering, and usually more poorly-controlled flaking. As noted above, Black Rock Concave-base points have been found in Hogup and Danger Caves in Utah, and in Nevada on NV Hu 17 (Heizer and Hester 1978) and on various sites along the east side of the Black Rock Desert (Heizer and Hester 1978).

Humboldt Sub-series

Humboldt Basal-notched

This type (see Appendix XIII, pp. 11 and 16) is a basically triangular point with a deep basal notch. It can be as large as the Black Rock Concave-base or as small as the Humboldt Concave-base (see below) but usually is much broader than the latter. It has been found in a dated level (5,400 B.P.) at Hanging Rock Shelter (Heizer and Hester 1978:3) in Nevada and in Levels II and III (9,750 [probably too early]-6,570 B.P.) at Danger Cave (Jennings 1978:35) in Utah and on the undated Nevada sites of Wagon Jack Shelter (Heizer and Baumhoff 1961) and NV Hu 15 (Heizer and Hester 1978).

Humboldt Concave-base (also called Base Type A)

This point (see Appendix XIII, pp. 10, 11, and 16) is a stemless lanceolate form with sides which are slightly excurvate, a base which is concave and constricted, a lenticular cross-section, and finely-controlled flaking (Aikens 1970:40). Aikens (1970:40) says that the basal constriction may have slight, but unpronounced, square or sloping shoulders. A number of sites containing this form have been dated: in Utah, strata 9-10 (7,350-2,500 B.P.) at Hogup Cave (Aikens 1970:28-29, Table 2; Heizer and Hester 1978:3) and in Levels II-V (Level III dates 7,100-6,570 B.P. and Level V dates 5,950-1,930 B.P. [Jennings 1978:35]) at Danger Cave (Aikens 1970:51; Heizer and Hester 1978:3; Jennings 1978); and in Nevada (Heizer and Hester 1978:2-3), at Newark Cave (5,470 B.P. $\pm$ 400 years), at Hidden Cave (end date of 3,050 B.P. $\pm$ 200 years), South Fork Shelter (3,320 B.P. $\pm$ 200 years, 4,310 B.P. $\pm$ 40 years, 4,360 B.P. $\pm$ 300 years), and Hanging Rock Shelter (5,300 B.P. $\pm$ 380 years). Other undated sites containing Humboldt Concave-base points include Cowboy Cave (Zier and Peebles 1982) and Sudden Shelter (Jennings 1978) in Utah, and in Nevada: NV Hu 22 (Heizer and Hester 1978), NV Hu 15 (Heizer and Hester 1978), and several isolated sites found during the survey of northeastern Nevada (Fowler 1968a): 26EK311, 26EK313, 26EK322, and 26WP121.

McKean Techno-complex (5,000-2,500 B.P.)

In the northern portion of the Great Basin and the Intermountain-Plateau region, as will be seen in the next section, the McKean Techno-complex is seen as part of a continuum consisting of the Black Rock-Humboldt series, the Pinto Basin series, and the McKean. But, in the main part of the Great Basin, the archeologists have followed the Plains tradition and have kept it more separate, perhaps because little of the complex has been reported. Two locations, both at Dinosaur National National Monument on the Colorado/Utah border, have had McKean complex materials reported in them. McKean complex materials were reported in Deluge Shelter in the Monument (Leach 1970; Zier and Peebles 1982:24) and Hannah and Duncan points were reported from the Lowell site (Breternitz 1970:160; Zier and Peebles 1982:24) in Colorado at the eastern end of the Monument. Since these materials have been already described earlier in this chapter (pp. 69-70), they need not be described again here.

Desert Complex (4,000-250 B.P.)

Into this complex fall four series of projectile points (see Appendix XII, pp. 11, 12, and 19): the Desert Side-notched series, the Cottonwood Triangular, the Rose Springs series, and Eastgate series. The dating of these series is somewhat problematical. While most series in the Great Basin have dates on levels containing one or more series dating 1,500 years B.P. or less, they apparently appear much earlier in Hogup Cave (strata 7 or 8 to 16 [3,450-100 B.P.]) and possibly Danger Cave (Aikens 1970:56; Jennings 1978:62). Jennings (1978:59) sees the appearance of these smaller, lighter projectile points as an indication that the bow and arrow has developed, while Heizer and Hester (1978:9) equate the "introduction of Rose Spring and Eastgate points...with the introduction of the bow and arrow." The three series can be broken down further into sub-types: Desert--General, Redding, Sierra, and Delta; the Rose Spring--corner-notched, contracting-stem, and side-notched; and the Eastgate--expanding-stem and split-stem.

Desert Side-notched

Many of the Desert Side-notched points appear morphologically the same as the Plains Side-notched sub-types, specifically: the Washita Triangular (pg. 75, this chapter) falls into the General variety, the Buffalo Gap Single-spur (pg. 75, this chapter) could fall into either the Redding or the Delta varieties, and the Emigrant Basal-notch (pg. 75, this chapter) falls into the Sierra variety. The major difference in the sub-types is in the base (straight, concave, V-shaped, or basal notch). The Redding and Delta are thought to be most common in California (Heizer and Hester 1978:10). Heizer and Hester (1978:11) suggest that the Desert Side-notched points could have developed as early as 1,970 years B.P. or even earlier (which would agree to degree with the findings in Hogup and Danger caves). Nevada sites with dates include (Heizer and Hester 1978:8-9): Conway Shelter (230 B.P. $\pm$ 100 years), NV Wa 355 or the Pyramid Lake site (240 B.P. $\pm$ 100 years), NV Pe 67 or the Hesterlee site (320 B.P. $\pm$ 50 years), Thompson site (330 B.P. $\pm$ 60 years), Gatecliff Shelter (470 B.P. $\pm$ 90 years, 550 B.P. $\pm$ 90 years, 590 B.P. $\pm$ 90 years, and 750 B.P. $\pm$ 90 years), Newark Cave (840 B.P. $\pm$ 340 years), and Deer Creek Cave (1,150 B.P. $\pm$ 110 years).

General variety

This variety has a small, isosceles triangular shape; has side notches and may have a basal notch; and straight to slightly convex blade sides (Fowler 1968b:7). The General variety of the Desert Side-notched point has been illustrated for NV Ch 15 (Heizer and Hester 1978) and Wagon Jack Shelter (Heizer and Baumhoff 1961) in Nevada. Some of the northeastern Nevada survey's sites (Fowler 1968a): 26EK325, 26EK330, 26EK422, and 6WP125, contain points which fall into the General variety or the Sierra variety.

Redding variety

The Redding variety has a small, elongated blade (longer than that of the general variety in relation to its width); straight sides; side-notches; and an expanding base (Fowler 1968b:8). It may also have a bell-shaped base and the side-notches are usually comma-shaped (Baumhoff and Byrne 1959:38). The Redding variety was shown for NV Ch 15 (Heizer and Hester 1978) and 26EK423, a site found on the northeastern Nevada survey (Fowler 1968a).

Delta variety

Commonly found in the delta area of the Sacramento-San Joaquin Rivers in California, this variety is marked by its V-shaped base which usually forms an isosceles triangle with angles of 45 degrees or more (Baumhoff and Byrne 1959:38). The Delta variety was represented on NV Ch 15 (Heizer and Hester 1978) and at Wagon Jack Shelter (Heizer and Baumhoff 1961) in Nevada.

Sierra variety

This variety is often found in the High Sierra of California (hence, the name) and in the Great Basin. Its distinguishing characteristic is the basal notch (Heizer and Baumhoff 1961:128). The Sierra variety, because of its basal notch, is the most easily identified and most often illustrated and reported: NV Ch 15 (Heizer and Hester 1978), various sites found on the northeastern Nevada survey (Fowler 1968a), Newark Cave (Fowler 1968b), Wagon Jack Shelter (Heizer and Baumhoff 1961), and Hogup Cave (Aikens 1970).

Cottonwood Triangular

Fowler (1968b:8) describes this point as a small triangular blade with no stem and having a concave base which forms down-raking tangs. Aikens (1970:35) adds that the blade edges are either straight or convex and that the base can also be straight or convex. The point (see Appendix XIII, pp. 11 and 19) appears to be the same as that which is referred to on the Plains as Late Prehistoric Triangular (see Appendix XIII, pg. 7, and pg. 17, this chapter). Cottonwood points have been found on dated sites (Heizer and Hester 1978:11-12): Nevada--NV Pe 67 or the Hesterlee site (320 B.P. $\pm$ 50 years), Newark Cave (840 B.P. $\pm$ 340 years), Conway Shelter (940 B.P. $\pm$ 120 years, 1050 B.P. $\pm$ 100 years), and the Scott site (940 B.P. $\pm$ 120 years), and Hogup Cave (Aikens 1970:29, 35) in Utah (stratum 8 [4,610 B.P. $\pm$ 100 years to 3,200 B.P. $\pm$ 140 years] to stratum 14 [1,200 B.P. $\pm$ 100 years to 620 B.P. $\pm$ 70 years]). Fowler (1968b:12, Table 1; 13, Table II; 30) also reported an additional Cottonwood point being found in level 3, Area I, at Newark Cave, a level which dated to 5,470 B.P. $\pm$ 400 years. Cottonwood triangular points have also been found on undated sites: Nevada--NV Ch 15

(Heizer and Hester 1978), the northeast Nevada survey sites: 26WP111 and 26WP201 (Fowler 1968a), Wagon Jack Shelter (Heizer and Baumhoff 1961), and, in Utah, the Fremont villages of the Evans site (Jennings 1978) and Caldwell Village (Jennings 1978).

Rose Spring-Eastgate Series

The Rose Spring sub-series and the Eastgate sub-series are quite often found together and there is some question as to whether the two are one series, two different series, or a continuum. Heizer and Hester (1978:8) see the two as a continuum and data from Hogup and Danger Caves in Utah (Aikens 1970:52, Fig. 2; 53, Fig. 3) which show the Rose Spring series starting earlier in both caves seem to support that idea. The Rose Spring Corner-notched was reported from strata 6 (6,400 B.P. $\pm$ 100 years, 5,960 B.P. $\pm$ 100 years) through 16 (2,200 B.P. $\pm$ 70 years, 1,810 B.P. $\pm$ 80 years, 480 B.P. $\pm$ 80 years) at Hogup and Rose Spring Side-notched started in Level III (7,150 to 6,620 B.P.) and continued through Level V (5,000 to 1,930 B.P.) at Danger Cave. The Rose Spring Side-notched begins in stratum 9 at Hogup, the Eastgate Expanding-stem in stratum 8, and both continue through stratum 16. In Danger Cave, the Rose Spring Corner-notched and the Eastgate Expanding-stem are found in Level V. However, Aikens (1970:56) treats the two sub-series as a unit, stating that these materials could be assigned a date range of 1,350 to 650 B.P. but might date prior to 4,450 B.P. and up to 100 B.P. at Hogup Cave. Other sites with dated contexts include (Heizer and Hester 1978:8-9): Utah--Swallow Shelter (2,630 B.P. $\pm$ 110 years); California--the King's Dog site (1,330 B.P. $\pm$ 90 years) and the Rodriguez site (1,050 B.P. $\pm$ 100 years); and Nevada--Lovelock Cave (1,210 B.P. $\pm$ 70 years), the Scott site (940 B.P. $\pm$ 120 years), Gatecliff Shelter (1,000 B.P. $\pm$ 90 years), O'Malley Shelter (870 B.P. $\pm$ 100 years, 890 B.P. $\pm$ 100 years), Newark Cave (840 B.P. $\pm$ 340 years), and Conway Shelter (230 B.P. $\pm$ 100 years, 940 B.P. $\pm$ 100 years). Both the Rose Spring sub-series and the Eastgate sub-series show strong similarities with the Wallula Rectangular-stemmed sub-series and the Middle Columbia Basal-notched (to be discussed below) found in the Inter-mountain/Plateau region (see Appendix XIII, pp. 11, 12, and 19 for the former two sub-series and Appendix XIII, pp. 18 and 19 for the latter two sub-series).

Rose Spring Sub-series

Rose Spring Corner-notched

This point has a small, isosceles triangular form, corner notches which form down-raking tangs and a stem which is either parallel-sided or expanding, and straight to slightly excurvate blade edges (Fowler 1968b:8). Aikens (1970:33) also adds that the width of the stem is less than the width of the blade above the corner notches. This form has been reported on the Nevada sites: NV Ch 15 (Heizer and Hester 1978), Wagon Jack Shelter (Heizer and Baumhoff 1961), Newark Cave (Fowler 1968b), and several sites of the northeastern Nevada survey (Fowler 1968a): 26EK322, 26EK403, 26WP100, 26WP102, and 26WP116, and at the Utah sites: Hogup Cave (as previously noted) and the Fremont site of Caldwell Village (Jennings 1978).

Rose Spring Side-notched

This form has been described (Aikens 1970:33) as having a triangular blade which is slender to medium in width in relation to its length; blade edges which can be convex or concave; side notches; a base which is slightly expanded, rounded, and may have small basal notches; and a stem width which is less than the width of the blade above the side notches. It has been reported from Hogup Cave in Utah (Aikens 1970; Jennings 1978).

Rose Spring Contracting-stem

According to Heizer and Baumhoff (1961:128), this point closely resembles the earlier Elko Contracting-stem but can be identified by its smaller size and horizontal rather than sloping shoulders. It has been reported for the Nevada sites of NV Ch 15 (Heizer and Hester 1978) and Wagon Jack Shelter (Heizer and Baumhoff 1961).

Eastgate Sub-series

Eastgate Expanding-stem

Fowler (1968b:8) describes this point as being triangular; having straight or slightly excurvate blade sides; having corner or basal-end notches which create wide, blunt, down-raking tangs and a straight base or stem; and having a lenticular cross-section. Heizer and Baumhoff (1961:123) add that the blade may attain a considerable length. The Eastgate Expanding-stem has been reported at the Nevada sites: NV Ch 15 (Heizer and Hester 1978), Newark Cave (Fowler 1968b), Wagon Jack Shelter (Heizer and Baumhoff 1961), and 26WP100, 26WP123, 26EU100, and several isolates found on the northeastern Nevada survey (Fowler 1968a) and at Hogup Cave (Aikens 1970) in Utah.

Eastgate Split-stem

This point tends to be more squat than the Expanding-stem variety and having straight or sloping shoulders, corner notches, and a concave base (Heizer and Baumhoff 1961:128; Fowler 1968a:17). A possible variant is described by Fowler (1968a:17) as having a narrow, elongated blade. This Split-stem point has been found in Nevada at the Wagon Jack Shelter (Heizer and Baumhoff 1961), NV Ch 15 (Heizer and Hester 1978), and 26EK423 and 26EK424, found on the northeastern Nevada survey (Fowler 1968a).



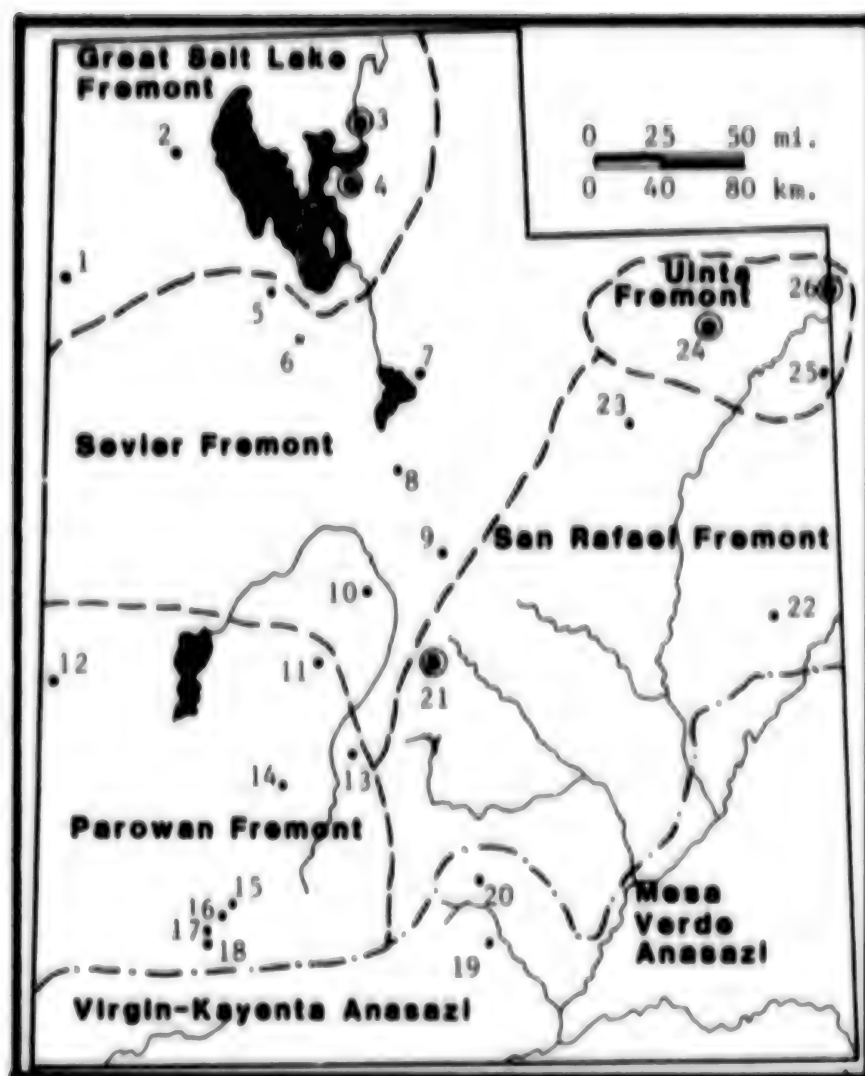
Figure 6-18.
Eastgate Split-stem
Point
(actual size)
Seedsadee Project
1983 Survey

Premont (1,550-600 B.P.)

Jennings (1978:155) sees the Fremont culture as being essentially a Utah phenomenon which was derived in situ from the Desert Archaic. He theorizes (1978:155) that "...it developed from the same early Mogollon or Hohokam pulsations from southwestern New Mexico or northern Mexico that triggered

the Anasazi developments", a statement guaranteed to raise a few eyebrows in the Southwest. Aikens (1966), however, believes in an eastern origin which is suggested on the bases of technology and stylistic similarities common to the Uinta Fremont, northwestern Great Plains, and Late Woodland projectile points. Madsen and Berry (1975) argue that a 1,000 year hiatus in Great Basin occupations indicates that the Fremont could not have developed there but, rather, developed from an Archaic base on the Colorado Plateau. Berry, however, shortens the time span of the hiatus to only 400 years at Deluge Shelter in Dinosaur National Monument on the Utah-Colorado border and suggests that that area should be more thoroughly studied to determine the Archaic-Fremont relationships. Dibble and Day (1963) reported Fremont sites in what is now Flaming Gorge Reservoir and Recreation Area in northeastern Utah and southwestern Wyoming and Sharrock (1966) found Fremont materials at the Pine Spring site in southwestern Wyoming. A number of petroglyphs in the Uinta Basin of southwestern Wyoming and northwestern Colorado have been identified as being Fremont in origin (Sharrock 1966).

Common characteristics of the Fremont (Jennings 1978:156) include: pithouses with great regional variations in size and shape; villages with two or three dwellings (often pithouses), a number of surface structures used either for dwellings or storage, and most often located on rises above arable lands; heavy reliance on game and wild plants but also on growing a type of maize unique to the Fremont, Fremont Dent; and various artifacts including stone balls, ornate unfired clay figurines, the unique Fremont moccasin, one-rod-and-bundle basketry, the "Utah" type metate which had a secondary depression or "shelf", and ceramics. Most of the pottery (particularly the earlier pottery) is a plain grayware, often with a great deal of surface manipulations--incising, punctating, pinching, and appliqueing of bands of "pellets". Painted black-on-white and corrugated Pueblo II wares generally did not appear until after 900 B.P. and were often alien wares (for example, Virgin-Kayenta Anasazi wares). Isolated granaries were also not uncommon, usually masonry structures in the walls of canyons or adobe in villages in the broader valleys. Also unusual and unique to the Fremont were their petroglyphs--trapezoidal or mummy-like human figures. Jennings (1978:156) states that the earliest dates for Fremont are between 1,500 and 1,450 B.P. and it may have lasted to 600 B.P. or later. Five sub-areas (see Figure 6-19, this chapter) are recognized for the Fremont occupations in Utah (Jennings 1978:156-159, Figures 141-143, 162): the Great Salt Lake Fremont with its Bear River phase (1,500-950 B.P.) and Levee phase (950-600 B.P.); the Uinta Fremont with its Cub Creek phase (pre-1,150 B.P.) and White Rocks phase (1,150-1,000 B.P.); the San Rafael Fremont, no recognizable phases (1,250-750 B.P.); the Sevier Fremont, again with no recognizable phases (1,130-690 B.P.), and Parowan Fremont with its Summit phase (1,050-900 B.P.) and Paragonah phase (900-650 B.P.). Where the Fremont went after 650 B.P. is as open to discussion as their origins. Wormington (1955) is inclined toward the theory that they were displaced by Ute or Shoshone hunting and gathering groups. Jennings (1978) agrees but goes further by suggesting it could have been the ancestors of the Utes, Paiutes, Goshutes, or the Shoshone. Aikens (1966) sees the Fremont merging with the Promontory culture to form the Dismal River Aspect of eastern Wyoming and Colorado and western Kansas and Nebraska. The Promontory were a mysterious culture



- | | |
|---|--|
| 1. Danger Cave | 15. Paragonah |
| 2. Hogup Cave | 16. Parowan |
| 3. Bear River (#1, #2, & #3), Levee & Knoll sites | 17. Evans Mound |
| 4. Willard, Warren, & Injun Creek sites | 18. Median Village |
| 5. Grantsville | 19. Harris Wash |
| 6. Tooele | 20. Coombs site |
| 7. Hinkley Farms | 21. Snake Rock, Old Woman, & Poplar Knob |
| 8. Nephi Mounds | 22. Turner-Look |
| 9. Ephraim | 23. Nine Mile Canyon |
| 10. Pharo Village | 24. White Rocks Village, Caldwell Village, Flat Top Butte, Gilbert, & Felter |
| 11. Kanosh | 25. Boundary Village |
| 12. Garrison | 26. Cub Creek sites |
| 13. Marysvale | |
| 14. Beaver | |

Figure 6-19. Fremont sites and sub-areas in Utah (after Jennings 1978: 157--Fig. 141).

occupying northwestern Utah at the same time as the Fremont but were believed to be distinct from the Fremont. It has since been suggested that the Promontory peoples were indeed Fremont but represented an aberrant group. Breternitz (1970) put forth the idea that the Fremont, rather than being displaced by the Utes and Shoshone, evolved into them. Finally, using changing weather and climatic conditions as the causes, Greasman (1980) presents the argument that they were forced to abandon the area.

Great Salt Lake Fremont (1,550-600 B.P.)

This sub-area, as the name suggests, is located in northwestern Utah, around the Great Salt Lake. Jennings (1978:162-179) notes some differences in pithouse construction between the two phases of this sub-area: the pithouses are smaller and round during the earlier Bear River phase while those of the later Levee phase are much larger, square, and have a long trench as a possible ventilator shaft. Other characteristics and artifacts found on Great Salt Lake Fremont sites include: the anthropomorphic figurines of unfired clay, stone and clay balls, tubular clay pipes, ceramics (Great Salt Lake Gray, Uinta Gray, and Promontory wares), Desert Side-notched projectile points, cylindrical and bell-shaped pestles, slate knives or sickles with curved or hooked blades, sandstone, basalt, or quartzite shaft smoothers, and hide fleshers made from bison ribs. The last four items are, apparently, not found in the other sub-areas.

Sites assigned to the Bear River phase include: the Indian Creek sites (Aikens 1966d, 1967; Jennings 1978), the Bear River sites--#1, #2, and #3 (Aikens 1966d, 1967; Jennings 1978), the Levee site (Fry and Dalley 1973; Jennings 1978), and Hogup Cave (Aikens 1970; Jennings 1978). The Levee phase sites were reported by Jennings (1978) to be: the Grantsville site (Marwitt 1970), the Tooele site (Marwitt 1970), the Bear River site #8, the Hinkley Farm site, the Willard site, and the Knoll site. A Fremont occupation in Danger Cave has not been assigned to either phase (Jennings 1978).

Uinta Fremont (pre-1,150-1,000 B.P.)

This sub-area occupies the northeastern corner of Utah. The distinguishing characteristics of this sub-area are not some artifact which is usually present, but two which are not present--the "Utah" type metates and the unfired clay figurines. While only the Uinta Gray ceramics, with very little surface manipulations present, are found on the earlier Cub Creek phase, Uinta Gray, with much more surface decorations present, dominates a ceramic assemblage which also contains alien pottery types (Jennings 1978:179-184). Pithouses are circular. Several of the later White Rocks phase villages are located in the valleys instead of on rises as was the case with the earlier Cub Creek phase villages.

Jennings (1978) lists the following sites as being Cub Creek phase: Boundary Village (Leach 1966), Deluge Shelter (Leach 1970), the Dam site, the Fremont Playhouse site, the Flat Top Butte site, the Felter Hill site, the Goodrich site, and the Whole Place Village site. White Rocks phase sites consisted of Caldwell Village (Ambler 1966; Jennings 1978) and White Rocks Village

(Shields 1967; Jennings 1978). Side-notched projectile points are found on White Rocks phase sites such as Caldwell Village (see Appendix XIII, pg. 12). Two sites, the Gilbert site and the Turner-Look site, have not been assigned to a phase.

San Rafael Fremont (1,250-750 B.P.)

Located along the eastern edge of Utah between the Uinta Fremont sub-area and the Mesa Verde and Virgin-Kayenta Anasazi occupations in southern Utah, this sub-area displays several features which differentiates it from the other sub-areas (Jennings 1978:184-206). Stone masonry, both wet and dry laid, is quite common. Many of the pithouses are slab-lined, usually have four center roof support posts, plastered walls, and stone-paved fireplace with a modeled clay rim. This stone-paved fireplace is not found in the other sub-areas. Sites in this sub-area contain the most ornate of the unfired clay figurines. Ceramics consist of Emery Gray, which has extensive punching, incising, pinching and appliqueing of the pellet bands.

Sites in this sub-area are: the Nine Mile Canyon sites (Moras 1931; Gillin 1955; Jennings 1978), Site N.M. #17 (Gillin 1955; Jennings 1978), the Snake Rock site (Aikens 1967; Jennings 1978), the Old Woman site (Taylor 1957; Jennings 1978), the Poplar Knoll site (Jennings 1978), the Windy Ridge site (Jennings 1978), the Crescent Ridge site (Jennings 1978), the Power Pole Knoll site (Jennings 1978), the Sky House site (Jennings 1978), and the Gates Roost site (Jennings 1978).

Parowan Fremont (1,050-650 B.P.)

This sub-area is the most southwestern in Utah. Unlike the other sub-areas, Parowan villages were usually located on alluvial fans where mountain streams entered valleys or out in the middle of the broader valleys. The villages appear to have been larger and occupied for longer periods of time (Jennings 1978:206-213). There also appears to have been a considerable amount of building and re-building at these sites. Early pithouses were circular, while the later ones were quadrilateral and had long ventilator shafts and stone slab deflectors. The firepits had modeled clay rims like the San Rafael firepits but lacked the slab paving. Surface, coiled adobe, granaries were common. While food bone scrap seems more abundant on Parowan Fremont sites, the dependence on maize also seems heavier. There are many bone tools, some of which are unique: flaked bone scrapers, perforated rectangular gaming chips or dice, finger rings, and split antler tools. The dominant ceramics included Snake Valley Gray, Black-on-white, and Corrugated, and, in later assemblages, Virgin-Kayenta ceramics appear. During the Paragonah phase a distinctive, basally-notched projectile point (see Appendix XIII, pg. 12) appears in association with Cottonwood Triangular points at the Evans site and the Median Village site. Other projectile points reported at the Evans site (Jennings 1978) include side-notched and corner-notched (see Appendix XIII, pg. 12).

Among the Summt phase sites are: the Evans site (Berry 1972; Jennings 1978) and the Garrison site (Jennings 1978). Paragonah phase sites include: the Evans site (Berry 1972; Jennings 1978) and Median Village (Jennings 1978).

Other Parowan Fremont sites not assigned to a phase include: the Kanosh site (Jennings 1978), the Paragonah site (Jennings 1978), and the Parowan site (Jennings 1978).

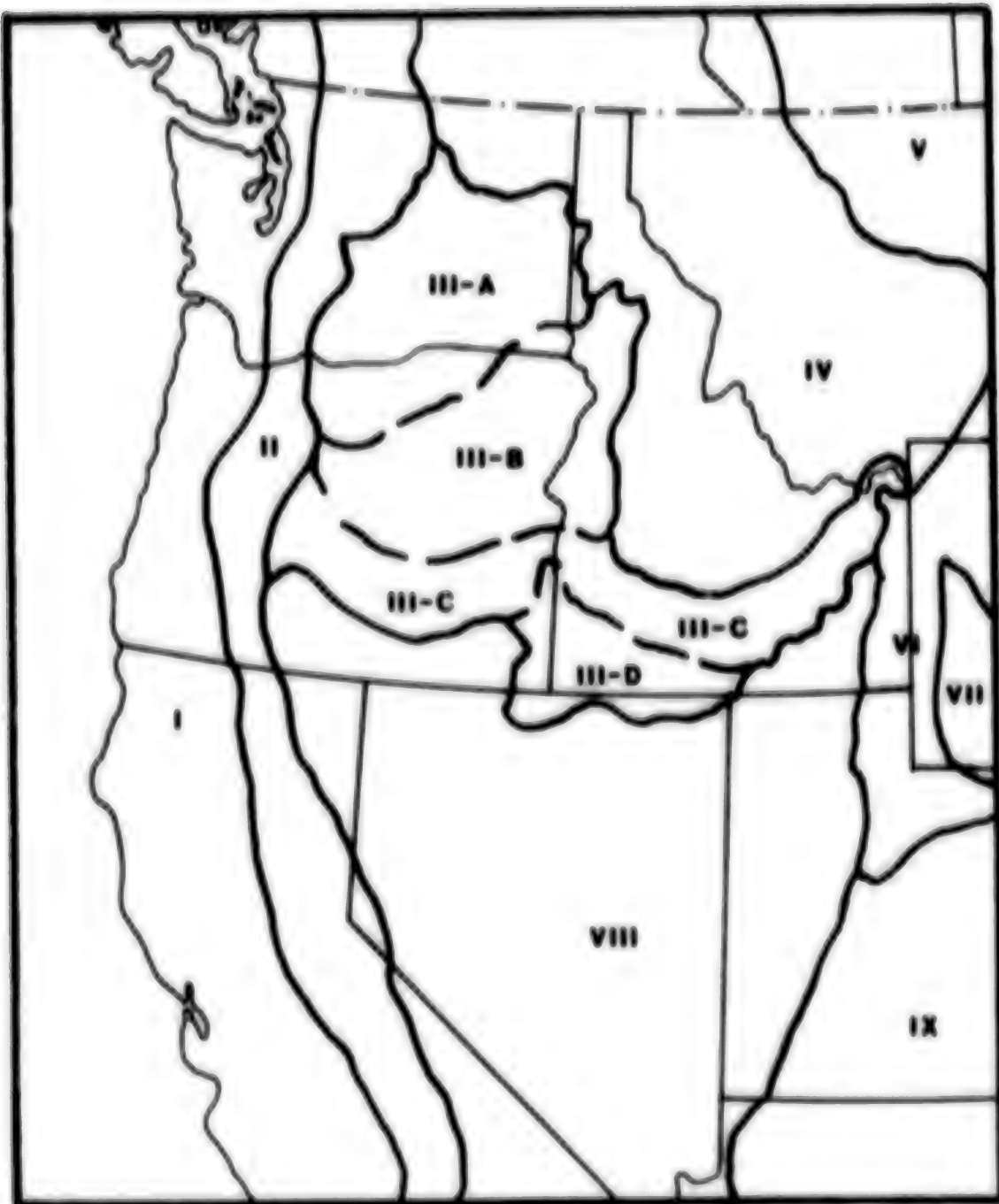
Sevier Fremont (1,130-690 B.P.)

Located in central Utah, this sub-area lacks specifically diagnostic traits but exhibits a blending of all the sub-areas, as might be expected. The Unfired clay anthropomorphic figurines are found here, as are many "Utah" type metates, stone and clay pipes, and Ivie Creek Black-on-white ceramics (Jennings 1978:213-220). As was the case in the Parowan sub-area, there seems to have been a lot of building and re-building at the Sevier sites, resulting in tall mounds of debris, similar to the tells of the Middle East. Nephi Mounds (Sharrock and Marwitt 1967; Jennings 1978), Pharo Village (Marwitt 1968; Jennings 1978), the Grantsville site (Marwitt 1968; Jennings 1978), and the Tooele site (Marwitt 1970; Jennings 1978) are Sevier Fremont sites.

INTER-MOUNTAIN/PLATEAU SEQUENCES (Figure 6-21)

The northwestern part of the United States (see Figure 6-20), which includes western Montana and Wyoming, all of Idaho, the northern portions of Utah, Nevada, and California, and all of Oregon and Washington, is comprised of six physiographic provinces: 1) the Pacific Border province, 2) the Sierra-Cascade province, 3) the Columbia Plateau province, 4) the Northern Rocky Mountains province, 5) the Middle Rocky Mountains province, and 6) the Basin and Range province. The first province covers the area from the Pacific coast to the crest of the Pacific coastal mountain ranges and stretches from southern California to British Columbia. The second parallels the first from south-central California through west-central Oregon and Washington to British Columbia from the Pacific coastal Mountain ranges to the relatively flat lands in central Washington and Oregon. The third occupies the southeastern third of Washington, most of the eastern half of Oregon, the northeast corner of Nevada, and the south and southwestern third of Idaho. The fourth covers northeastern Washington, the southern portions of British Columbia and Alberta, most of the northern two thirds of Idaho, and the western part of Montana. The fifth includes northwestern and western Wyoming, southwestern Montana, a narrow strip in eastern Idaho, and northeastern Utah. The final province occupies northwestern Utah, a small portion of southeastern Idaho, south-central Oregon, and nearly all of Nevada. The Columbia Plateau and the Northern Rocky Mountains are the provinces of prime concern here, although the Basin and Range and the Middle Rocky Mountains must also be noted.

Once the physiographic provinces have allowed the scope of this examination to be narrowed, the biotic provinces within and cross-cutting the physiographic provinces allow further differentiation. Swanson (1962:153) divides the northwestern United States (or here, the Inter-mountain/Plateau region) into four settings: 1) Pacific slopes of the Cascades, 2) the Rocky Mountain range, 3) the Snake River Plain, and 4) the Columbia Plateau. The first setting has a mild oceanic climate with abundant rainfall, while the second has a more continental climate, although it changes north of the Salmon River in Idaho and more closely approximates that of the first. The third



- | | | | |
|-----|------------------|------|-------------------------|
| I | Pacific Border | IV | Northern Rocky Mountain |
| II | Sierra-Cascade | V | Great Plains |
| III | Columbia Plateau | VI | Middle Rocky Mountain |
| -A | Columbia Basin | VII | Wyoming Basin |
| -B | Central Mtns. | VIII | Basin and Range |
| -C | High Lava Plains | IX | Colorado Plateau |
| -D | Owyhee Upland | | |

Figure 6-20. Physiographic provinces of the Inter-mountain/Plateau region (based on Butler 1966:33, Fig. 4).

setting is really part of the second but is set aside because it is a "narrow Plains-like setting which grades almost imperceptibly into the valleys of the Central Rocky Mountains" (Swanson 1962:154). The fourth setting was closely related to the first two in the late Pleistocene, but the climate worsened and it is now characterized by generally low relief, poor drainage, and sparse vegetation (Swanson 1962:154). According to Swanson (1962:154), the Columbia Plateau resembles the Snake River Plain with regards to the low relief and vegetation, although the latter is usually associated with the Great Basin because of its flora and fauna and with the Central Rocky Mountains for physiographic reasons. Swanson (1962:153) also sub-divides the Rocky Mountain setting into two regions, the area north of the Salmon River, which more closely resembles the Cascade setting with more rainfall and more evenly distributed rainfall, and the area south and east of the Salmon River, in which the mountain valleys are open and intergrade into forest parklands with open meadows. During the late Pleistocene, Swanson (1962:153) feels, both the Cascade setting and the Rocky Mountain setting would have had far more abundant surface water in the form of marshes, lakes, and rivers and would have been important natural settings for early man. Wild animals, fish, and a variety of plants would have been available for exploitation.

Butler (1966:46), on the other hand, divides the area into five settings or biotic provinces: 1) Northern Rocky Mountains, 2) Central Rocky Mountains, 3) northern Great Basin, 4) Columbia Plateau, and 5) Payette. The first setting Butler describes as being within the main portion of the Pacific climate-vegetation zone and covers the area north of the Salmon River and west of the Continental Divide, which includes much of Southeastern British Columbia, northwestern Montana, and parts of eastern Washington and Oregon. The second includes all the remaining mountain areas of Idaho except the Owyhee Mountains. The northern Great Basin occupies the Snake River Plain and the adjoining valleys of the Northern Rocky Mountain physiographic province in eastern Idaho, the arid plateaus in southwestern Idaho, northwestern Utah, northern Nevada, northeastern California, and eastern Oregon. The Payette, as Butler (1966:46) says, is not as clearly described but appears to be located at the west end of the Snake River Plain in Idaho and eastern Oregon. The Columbia Plateau is then bordered on the west by the Sierra-Cascade physiographic province on the west, the northern Great Basin setting on the south, Northern Rocky Mountain setting on the north and east, and the Central Rocky Mountain and Payette settings on the east. Butler (1966:36-37) has also divided the Columbia Plateau physiographic province into the Columbia Basin, the Central Mountains, the High Lava Plains, and the Owyhee Upland (see Figure 6-20). The last occupies the area in the southwest corner of Idaho and southeast Oregon and is bordered on the west, south, and east by the Basin and Range province and on the north by the High Lava Plains sub-province. The High Lava Plains covers the Snake River Plain and extends west to the Sierra-Cascade province, being bordered on the south by the Basin and Range province and on the north by the Central Mountains sub-province. The Central Mountains sub-province covers a narrow strip along the Idaho-Oregon border from the Weiser River to the Clearwater River and runs west and southwest through northeastern and central Oregon to the Sierra-Cascade Province. The Columbia Basin is bordered by the Sierra-Cascade province on the west, the Northern Rocky Mountain province on the north and east, and the Central Mountain sub-province on the south. The High Lava Plains sub-province or Snake River Plain, the Columbia Basin sub-province, and the portion of the Northern Rocky Mountain physiographic

province south of the Salmon River seem to be the most important areas in terms of early man sites in the Inter-mountain/Plateau region. Several early cultural manifestations seem to be present in these areas about the same time. In the Cascades and in the Columbia Basin area, the sites show the exploitation of riverine resources, small game, and plants (Gruhn 1961:152) and Old Cordilleran tradition projectile points and artifacts. Swanson (1963:153) also reports an early adaptation to streams and lakes in the Cascades with an emphasis also being placed on big-game hunting and the gathering of berries. In the southern portion of the Rocky Mountain province, although there is also evidence for the Old Cordilleran, the traditions being found represent the Plains Lanceolate types. On the Snake River Plain, nearly a dozen sites are known to have contained Folsom complex materials and both Clovis and Folsom sites are known for the Oregon and Washington parts of the High Lava Plains, Central Mountain, and Columbia sub-provinces of the Columbia Plateau (Campbell 1956; Osborne 1956; Gruhn 1961; Swanson 1961; Swanson and Bryan 1964; and Butler 1970). Gruhn (1961:127-128) also reports:

...classic parallel-flaked point types like Scotts-bluff, Eden, Angostura, Plainview, and Milnesand, along with a wide range of variant large lanceolate parallel-flaked points, are fairly numerous as far west as Owyhee and Twin Falls counties in southwest Idaho, and are also fairly frequent finds in the desert blowouts west and north of American Falls, in Power, Blaine, and Bingham counties. Surface finds are also reported from the Snake River Plain in Butte, Lincoln, and Jerome counties.

Gruhn (1961:151) further suggests Folsom complex materials found near Challis, Idaho, may indicate the movement of people through mountain passes from Montana into that area. Butler (1966:36) states that the High Lava Plains may have been "both a natural and a cultural continuation of the Great Plains into the Intermontane area" and notes (1965a:8-9) that from the Snake River Plain there are three routes to the Great Plains: 1) up Henry's Fork of the Snake River, through Island Park, through the meadows around Hebgen Lake and Reynolds Pass, and down the Madison River to the grasslands of the Lower Yellowstone and the Montana Plains, 2) through the Teton Basin, over Misquito Pass, up the Hoback River pass Rim Station and into the western Wyoming Plains, and 3) from the American Falls Reservoir up the Portneuf River, then past Montpelier, Soda Springs, and across a series of low hills to Black's Fork of the Green River (basically the old Oregon Trail route). Gruhn (1961:151) agrees that many of the Folsom hunters were attracted from the east by the large herds of herbivores: horse, camel, and bison, and that, from this area, these traditions spread westward into the Columbia Plateau, thus explaining the occurrence of similar projectile points in those adjacent areas of Oregon and Washington.

PALEO-INDIAN (12,000-8,000 B.P.)

As noted above, the Sierra-Cascade and Rocky Mountain physiographic provinces were probably extremely well-watered during the late Pleistocene and Gruhn (1961:150) reports that most of Idaho during this period, with the exception of the higher peaks in the central and panhandle parts of that

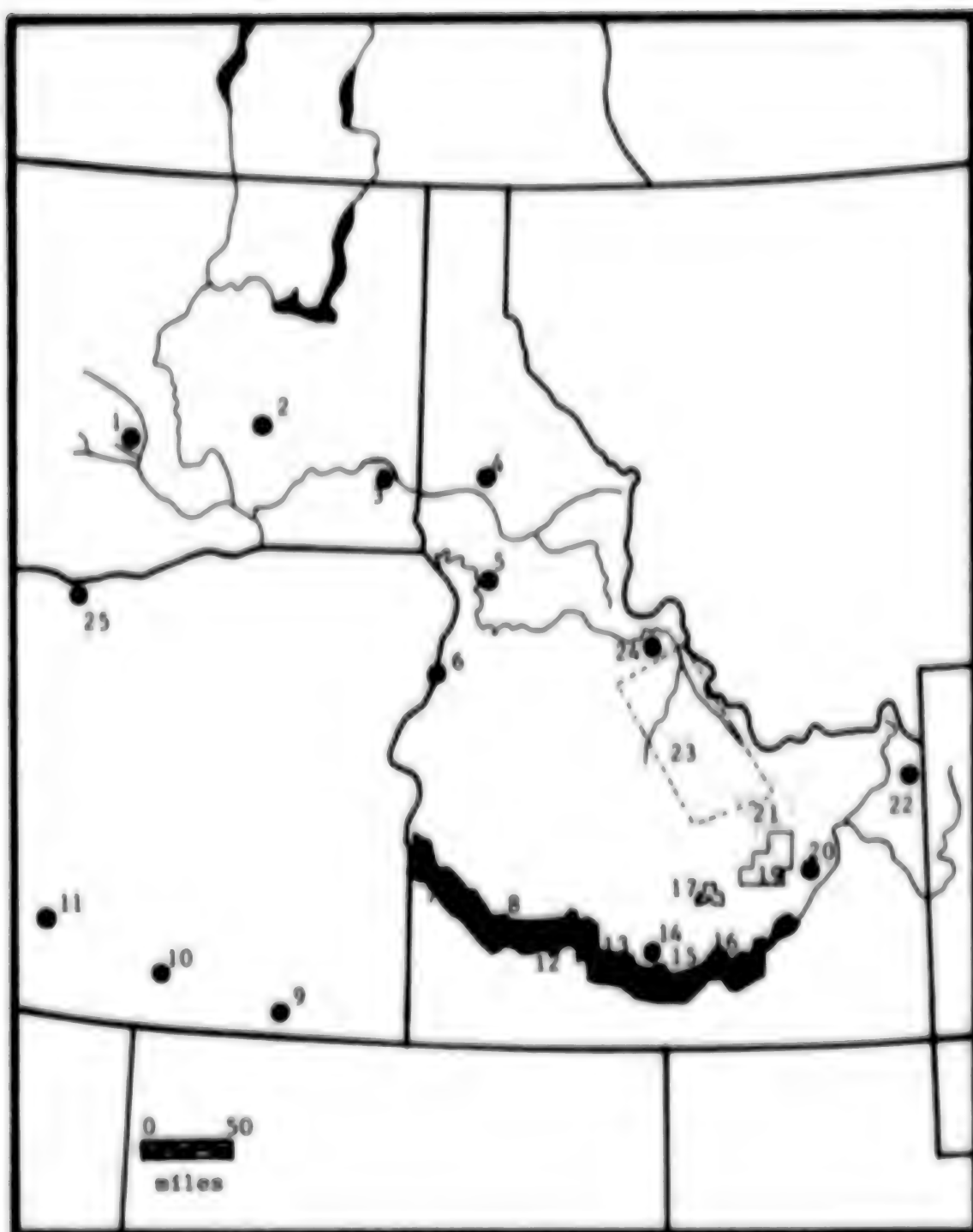


Figure 6-21. Inter-mountain/Plateau sites. (after Butler 1965a, 1966, 1968, 1970a, 1970b, 1971; Campbell 1956; Cressman 1960; Daugherty 1956; Gaarder 1967; Leonhardy & Rice 1970; Lynch, Wilkinson, & Warren 1965; Sneed 1967; Swanson 1961; Swanson & Bryan 1961; Swanson, Butler, & Bonnicksen 1964; Swanson, King, and Chatters 1969; Swanson, Powers, and Bryan 1964; Swanson & Ranere 1970; Swanson & Sneed 1967, 1971; Warren 1968; Warren, Sims, & Pavesic 1968; Weide & Weide 1969).

KEY TO SITES IN FIGURE 6-21.

1. Wenas Creek
2. Lind Coulee
3. Wexpusium
4. Bruce's Eddy
5. Little Camas Prairie sites (incl. Grave Creek/Rocky Canyon Locality [incl. Weiss Rockshelter & Cooper's Ferry], & Eagle Creek)
6. Helle Canyon (incl. McGraw, Big Bar, Squaw Creek Rockshelter, Switchback, & 10-AM-2)
7. 10-OE-128 & 10-OE-129
8. Southwest Idaho survey (incl. 10-CA-4, 10-CA-10, 10-CA-14, 10-CA-26, 10-CA-32, 10-CA-33, 10-CA-115, 10-OE-14, 10-OE-42, 10-OE-67, 10-OE-69, 10-OE-70, 10-OE-73, 10-OE-77, 10-OE-78, 10-OE-79, 10-OE-83, 10-OE-88, 10-OE-97, 10-OE-98, 10-OE-115, 10-OE-119, 10-OE-124, 10-TF-39, 10-TF-47, 10-OE-52, 10-TF-55, 10-TF-58, 10-TF-61, 10-TF-83, 10-TF-93, 10-TF-94, 10-TF-95, 10-TF-103, 10-TF-104, 10-TF-105, 10-TF-106, 10-TF-108, 10-TF-110, & 10-TF-113)
9. Coyote Flat
10. Warner Valley
11. Fort Rock Valley (incl. Connley Caves, Fort Rock Cave, Cougar Mountain Cave)
12. Glenn's Ferry
13. Jerome
14. Wilson Butte Cave
15. Pence-Deurig Cave
16. Lake Channel Locality (incl. Lake Channel & Haskett)
17. Craters of the Moon National Monument
18. National Reactor Testing Station
19. Warden (incl. Owl Cave)
20. Birch Creek Valley (incl. Uncle Ike Creek site, Cottontail Rockshelter, Bobcat Rockshelter, Desert Zone site, Jackknife Cave, Jaguar Cave, Bison Cave, Veratic Cave, 10-BT-62, 10-CL-35, 10-CL-46, & 10-CL-100)
21. Railroad Ranch (incl. 10-FM-5, 10-FM-25, 10-FM-26, 10-FM-27, 10-FM-31, & 10-FM-50)
22. BLM Salmon District
23. Challis Bison Jump (incl. Quill Cave)
24. Shoup Rockshelters (Alpha & Beta)
25. The Dalles

state, remained unglaciated. The Snake River Plain, the Clearwater Plateau of west-central Idaho, and much of the Columbia Plateau were probably better watered grasslands than they are today and would have attracted large herds of big-game animals, which, in turn, would have attracted the attention of the big-game hunters. Perhaps the earliest dates reported are from Wilson Butte Cave (Gruhn 1965:57): 14,500 B.P. $\pm$ 500 years on bone samples from the lower level of Level C and 15,000 B.P. $\pm$ 800 years on bone from Level E. While not assignable to any recognized cultural manifestations, Level E also contained bone fragments with what appear to be cutting marks on them (Gruhn 1961: Plate 21) and Level C had five artifacts associated with the bone samples (Gruhn 1965:57). However, these dates may be open to criticism. First, Gruhn (1965:57) states that "Both samples consisted of unidentifiable fragments of bone of small and large mammals." Second, she reports that "the Stratum C sample is a pooled collection of bone fragments from the lower zone of this stratum in three squares...." Both the mixing of bone from different animals and taking samples from different areas of the cave and pooling them to get a single date seem questionable practices.

There are a number of sites in the Inter-mountain/Plateau region, however, with temporally/culturally diagnostic artifacts and these will be discussed next. Figure 6-21 shows the locations of many of the sites to be discussed and the regional chronologies and dates at a few sites are presented in Tables 6-1 and 6-2.

Clovis complex (12,000-11,000 B.P.)

The Clovis complex has been described previously (pp. 62 and 79, this chapter, and see Appendix XIII, pp. 1, 8, and 13) and will not be repeated here. Clovis sites, according to Gruhn (1961:151), are rare in Idaho. There are reports of a badly vandalized site near Jarbridge, Idaho, from which a number of Clovis and Folsom projectile points have been removed (Jennings 1978:21). What appears to be a Clovis point was found at Coyote Flat in Oregon (Butler 1970a:Fig. 3-c). Osborne (1956:39-41) lists in general terms the locations of three other Clovis point finds: 1) "...collected in eastern Oregon by a hunter...", 2) "...found in the Black Hills area west of Olympia..." (Washington), and 3) "...found ...on the Washington side across the Columbia River from the Dalles, Oregon." This last point deserves some comment. Osborne himself thought at first that this point was a Folsom (1956:41). However, he showed it to Alex Krieger who "pointed out, however, that it is 'simply too large and heavy for a Folsom' and that, because it lay outside the range of the Folsoms, it should be classified with the Clovis fluted points." This was unfortunate, for, as can be seen in Figure 6-22, and from its dimensions: length--69 mm, width--34 mm, thickness--6-7 mm, and weight--19 gm, it is well within the range of the Folsom points known today.

Lind Coulee (12,000-10,500 B.P.)

This projectile point is the hallmark of the earliest phase of the Old Cordilleran tradition or complex, the Lind Coulee phase, named for the site at Lind Coulee Draw in central Washington. Daugherty (1956:246-247) describes what are basically three forms of this point, two with tapered stems and one with a parallel-sided stem. The first tapered-stem form, long and slender in shape, could be differentiated from the other by its rounded shoulders

and convex base; its stem may or may not be ground. The second form also had an asymmetry in its shoulders—one was sharp while the other was rounded; like-wise, its stem may or may not show signs of grinding. The third form, as its name suggests, has a parallel-sided stem and is shorter, broader, and more triangular in shape. The Lind Coulee point has been reported at the Washington sites of Lind Coulee (Daugherty 1956) and Marmes Rockshelter (Butler 1969) and the Idaho site of Cooper's Ferry (Butler 1969). Leonhardy and Rice (1970) also report sites containing Lind Coulee points, which make up a part of their Windust phase (see below), but fail to specify which sites they are.

Folsom complex (11,00–10,500 B.P.)

The Folsom complex, like the Clovis, has already been reported on (pp. 62 and 81, this chapter, and Appendix XIII, pp. 1, 8, and 13) and will not be commented on further here, except to list where Folsom complex materials have been found.

Folsom (fluted)

As noted earlier, Folsom materials have apparently been removed from a vandalized site near Jarbridge, Idaho (Jennings 1978:21). Other Folsom finds include Coyote Flat in Oregon, the Idaho sites at Lake Channel (Campbell 1956); near Challis (Swanson 1961); in Birch Creek Valley (Swanson & Bryan 1964); and on surveys at the National Reactor Testing Station (Butler 1970b) and on the northeastern Snake River Plain (Swanson 1961), and in Washington on the Columbia River across from the Dalles, Oregon (Osborne 1956). The Coyote Flat, Challis, Lake Channel, National Reactor, and Snake River Flood Plain points are shown in Appendix XIII, pg. 13.



Figure 6-22.
Folsom point found across the Columbia River from the Dalles, Oregon, originally identified by Osborne (1956) as Clovis (actual size).

Midland (unfluted)

One projectile point (see Appendix XIII, pg. 13) which appears to be a Midland was found during the National Reactor Testing Station survey (Butler 1970b:Fig. 4).

Agate Basin (10,500–10,000 B.P.)

The Agate Basin complex has been described above (pg. 63, this chapter, and see Appendix XIII, pg. 2) and will not be redescribed here. A number of sites in Idaho have had Agate Basin points reported on them: 10-FN-50 (Swanson & Ranere 1970), near Glenn's Ferry (Kahoe 1955), Weis Rockshelter (Butler 1962), Wilson Butte Cave—point type 2a (Gruhn 1961:127), and on the Snake River Plain (Swanson 1961) and in Birch Creek Valley (Swanson & Bryan 1964). Several points in the Birch Creek Valley identified as Agate Basin may be Haskett Type 1, a point type described below (see also Appendix XIII, pp. 15–16).

Hell Gap (10,000-9,500 B.P.)

The Hell Gap complex was outlined previously (pg. 63, this chapter, and see Appendix XIII, pg. 3) and will not be elaborated upon further. Hell Gap points have been reported in the Birch Creek Valley (Swanson & Bryan 1964), but some of these may be Haskett Type 2, which resemble the Hell Gaps in shape (see Appendix XIII, pg. 16).

Plainview (10,000-9,000 B.P.)

The Plainview point was presented earlier (pg. 64, this chapter, and Appendix XIII, pp. 3 and 13) and needs not be described again. Plainview points are known in Idaho from Weis Rockshelter (Butler 1962), 10-FM-26 (Swanson & Ranere 1970), 10-CL-100 (Swanson, Butler, & Bonnichsen 1964), 10-BT-62 (Swanson, Butler, & Bonnichsen 1964), and Wilson Butte Cave--point type 2b (Gruhn 1961:127), and in Washington "...in the Chehalis River Valley west of ...Olympia" (Osborne 1956:42).

Windust Phase (10,000-8,000 B.P.)

This is the earliest phase of a cultural sequence proposed by Leonhardy and Rice (1970) primarily for archeological sites in central Washington (see Tables 6-1 and 6-2). They describe the point forms of this phase as having short blades; shoulders whose prominences vary; usually straight or contracting stems; and straight or slightly concave bases. Occasionally unifacially or bifacially-flaked lanceolate points are also found. The points which Leonhardy and Rice used as illustrations (1970:5, Fig. 2) look like Lind Coulee, Cascade (described below), Pinto Basin Sloping-shoulder, and Black Rock-Humboldt-McKean Lanceolate (see Appendix XIII, pg. 14). They list dates for this phase as 11,950-8,950 B.P. (1970:6) but Jennings (1974:183) feels that 10,000-8,000 B.P. fits the archeological data better. Sites which Leonhardy and Rice (1970:4) feel have components dating to this phase include: Marmes Rockshelter (Butler 1969), Lind Coulee (Daugherty 1956), Windust Caves (45FR46), and Granite Point Locality (45WT41). Two other sites they feel may have Windust components are Thorn Thicket (45WT36) and 45WT35.

Milnesand (9,500-9,000)

Wormington (1957:265) describes this point as resembling Plainviews but having straight or very slightly convex or concave bases; basal grinding often extending more than halfway up the sides; a beveled appearance, the result of removing many small thinning flakes from the base; and parallel-transverse flaking. Length range is usually between 3.8 and 7.5 cm. This point type (see Appendix XIII, pg. 13) was reported by Swanson, Powers, and Bryan (1964) on 10-OE-124 and Gruhn (1961) at Wilson Butte Cave (point type 2c).

Alberta (9,500-9,000 B.P.)

As has been the case with many of the points in this section, the discussion of this point was presented earlier in this report (pg. 64 and see Appendix XIII, pp. 3 and 13) and the previous comments will not be repeated here.

Regional Chronological Sequences.

Date (in years B.P.)	Daugherty 1958, 1961	Leonhardy & Rice 1970	Butler 1966	Swanson, Butler, & Bonnichsen 1964	Gruhn 1961	Date (in years B.P.)
0	Historic	Ethnographic	James Prairie Phase	Lehmi Phase	Wilson Butte VI	0
1,000	Snake River Period	Snake River Period	Rocky Canyon Phase	Blue Dome Phase	hiatus	1,000
2,000				Beaverhead Phase		2,000
3,000	Develop- mental Snake River Period	Initial Snake River Period	Grave Creek Phase		Wilson Butte V	3,000
4,000						4,000
5,000						5,000
6,000	Transi- tional Period		Craig Mountain Phase	Bitterroot Phase	hiatus	6,000
7,000					Wilson Butte IV	7,000
8,000		Pioneer Period			Wilson Butte III	8,000
9,000				Birch Creek Phase	hiatus	9,000
10,000					Wilson Butte II	10,000
11,000						11,000
12,000					Wilson Butte I	12,000
13,000						13,000
14,000						14,000

Table 6-1. Proposed cultural chronologies for the Inter-mountain/Plateau region (after Gruhn 1961; Swanson, Butler, & Bonnicksen 1964; Butler 1966; and Leonhardy & Rice 1970).

The point was found at Coyote Flat in Oregon (Butler 1970a) and in Idaho at: 10-TF-55 (Swanson, Powers, & Bryan 1964), 10-TF-106 (Swanson, Powers, & Bryan 1964), the Uncle Ike site (10-BT-52) in Birch Creek Valley (Swanson, Butler, & Bonnichen 1964), and near Jerome (Swanson 1961).

Cody Complex (9,000-8,500 B.P.)

The Cody complex materials have already been described (pp. 64 and 81, this chapter, and see Appendix XIII, pp. 2 and 13) and will not be commented upon further here. One Eden projectile point was reported as a surface find in southwestern Idaho (Swanson 1961) and Caywood's (1947) Yuma point found on the Snake River in western Idaho may have been another Eden. Several Scottsbluff points were recorded by Butler (1970a) at Coyote Flat in Oregon and Osborne (1956:42-43) reported another "from 'western Washington or British Columbia'."

Birch Creek (9,000-7,000 B.P.)

Very few Birch Creek points have been reported in the literature. Butler (1966:118, fig. 24) illustrates a Type A (see Appendix XIII, pg. 14) found on a site at the mouth of the Portneuf River, north of Pocatello, Idaho, but does not describe it. Swanson, King, and Chatters (1969:33) note that a Type A Birch Creek point was found in the Salmon River valley but do not provenience it further and do not describe either. They (1969:33) further mention a Birch Creek Type B and Type C as occurring in the same region at a later date (8,150-3,400 B.P.) and show (1969:36, fig. 2-0) a Type B (see Appendix XIII, pg. 14) in their illustrations, but again, they do not describe either type. In outline, the Type A looks like a Milnesand while the Type B might otherwise be called a Haskett (either type), described below.

TERMINAL PALEO-INDIAN (undated)

Unnamed Lanceolate I

This point type was discussed earlier (pg. 67, this chapter, and see Appendix XIII, pg. 4). These are often stemmed and have concave bases (see Appendix XIII, pg. 14) and may resemble the Pryor Stemmed of the Great Plains. They were noted by Swanson, Powers, and Bryan (1964) on the Idaho sites: 10-OE-14, 10-OE-119, and 10-OE-124.

Unnamed Lanceolate II

Like the unnamed lanceolate I points, these were presented earlier (pg. 67, this chapter, and see Appendix XIII, pg. 4). These appear to have been larger, unstemmed points with straight, slightly concave or slightly convex bases (see Appendix XIII, pg. 14). Swanson, Powers, and Bryan (1964) reported finding them on 10-TF-55 in Idaho as did Butler (1970b) at the National Reactor Testing Station.

McKean-like Possibly Terminal Paleo-Indian Lanceolate

This point, which has been discussed previously (pg. 67, this chapter, and see Appendix XIII, pg. 4), has a concave base which forms asymmetric "ears" and may be the predecessor to the Black Rock-Humboldt-McKean-Pinto Basin

Table 6-2.

Inter-mountain/Plateau Chronologies

Period/Type	Dates	Source
Agate Basin	10,500-10,000 B.P.	Swanson & Ranere, 1970
Plainview	9,950-7,950 B.P.	Swanson & Ranere, 1970
Bitterroot (Northern)		
Side-notched	9,000-3,000 B.P.	Hester, 1973
Black Rock	7,850-2,650 B.P.	Hester, 1973
Humboldt	5,920-3,100 B.P.	Hester, 1973
Pinto Series	5,300-2,700 B.P.	Hester, 1973
	3,400-3,000 B.P.	Swanson & Ranere, 1970
Elko Series	4,000-820 B.P.	Hester, 1973
Rose Spring/Eastgate Series	1,500 B.P.- Historic	Hester, 1973
Desert Side-notched	1,300 B.P.- Historic	Hester, 1973
Cottonwood	1,100 B.P.- Historic	Hester, 1973
Windust Phase	10,000-9,000 B.P.	Leonhardy & Rice, 1970
Cascade Phase	8,000-3,000 B.P.	Leonhardy & Rice, 1970
Tucannon Phase	5,000-2,500 B.P.	Leonhardy & Rice, 1970
Harder Phase	2,500-700 B.P.	Leonhardy & Rice, 1970
Piqunin Phase	700-300 B.P.	Leonhardy & Rice, 1970
Numipu Phase	300-100 B.P.	Leonhardy & Rice, 1970
Birch Creek Phase	9,000-7,000 B.P.	Butler, 1966
Bitterroot Phase	7,000-3,000 B.P.	Butler, 1966
Beaverhead Phase	3,000-1600 B.P.	Butler, 1966
Blue Dome Phase	1,600-600 B.P.	Butler, 1966
Lehmi Phase	600 B.P.-???	Butler, 1966
Craig Mountain Phase	7,400-3,500 B.P.	Butler, 1966
Grave Creek Phase	3,500-2,100 B.P.	Butler, 1966
Rocky Canyon Phase	2,100-600 B.P.	Butler, 1966
Camas Prairie Phase	600 B.P.-???	Butler, 1966
Weis Rockshelter, level 5C	4,630 B.P. $\pm$ 70 years	Butler, 1966
Weis Rockshelter, level 5E	6,300 B.P. $\pm$ 100 years	Butler, 1966
Weis Rockshelter, level 5G	7,430 B.P. $\pm$ 140 years	Butler, 1966
Jackknife Cave, test pit 1, level 3	385 B.P. $\pm$ 65 years	UCLA #257 (Radiocarbon, V. 6)
Jackknife Cave, test pit 1, level 6	1,700 B.P. $\pm$ 75 years	UCLA #258 (Radiocarbon, V.6)

Table 6-2. (cont.)

Period/Type	Dates	Source
Bison Cave, unit 1	14,500-10,000 B.P.	Butler, 1966
Bison Cave, unit 2	(14,500-13,000)-6,900 B.P.	Butler, 1966
Bison Cave, unit 3	6,900-3,500 B.P.	Butler, 1966
Bison Cave, unit 4	3,500-3,400 B.P.	Butler, 1966
Bison Cave, fea. 16, level 16	3,360 B.P. $\pm$ 100 years	UCLA #130 (<u>Radiocarbon</u> , V. 5)
Bison Cave, unit 5	3,000-900 B.P.	Butler, 1966
Bison Cave, fea. 9, level 16	2,960 B.P. $\pm$ 100 years	UCLA #219 (<u>Radiocarbon</u> , V. 5)
Bison Cave, fea. 12, level 12	2,350 B.P. $\pm$ 120 years	UCLA #220 (<u>Radiocarbon</u> , V. 5)
Bison Cave, unit 6	900-160 B.P.	Butler, 1966
Bison Cave, unit 7	160-80 B.P.	Butler, 1966
Veratic Cave, fea. I, level 20	370 B.P. $\pm$ 80 years	UCLA #217 (<u>Radiocarbon</u> , V. 5)
Veratic Cave, charcoal, level 22	1,580 B.P. $\pm$ 80 years	UCLA #160 (<u>Radiocarbon</u> , V. 5)
Veratic Cave, fea. 8, level 26	2,920 B.P. $\pm$ 120 years	UCLA #218 (<u>Radiocarbon</u> , V. 5)
Veratic Cave, fea. 3, level 29	5,670 B.P. $\pm$ 120 years	UCLA #162 (<u>Radiocarbon</u> , V. 5)
Veratic Cave, charcoal, level 29	5,870 B.P. $\pm$ 120 years	UCLA #161 (<u>Radiocarbon</u> , V. 5)
Jaguar Cave	10,370 B.P. $\pm$ 350 years 11,580 B.P. $\pm$ 250 years	Butler, 1966 Butler, 1966
Cottontail Rockshelter, test pit 4, layer 5	150 B.P. $\pm$ 125 years	Swanson, Butler, & Bonnichsen 1964
Cottontail Rockshelter test pit 2, layer 20	4,420 B.P. $\pm$ 145 years	Swanson, Butler, & Bonnichsen 1964

Table 6-2. (cont.)

Period/Type	Dates	Source
10-CL-100, test pit 1, layer 3, hearth II	365 B.P. $\pm$ 80 years	Swanson, Butler, &
Bonnichsen 1964		
10-CL-100, test pit 1, layer 3, hearth I	1,420 B.P. $\pm$ 80 years	Swanson, Butler, & Bonnichsen 1964
10-CL-100, test pit 2, layer 4	1,820 B.P. $\pm$ 80 years	Swanson, Butler, & Bonnichsen 1964
10-CL-100, test pit 2, layer 8	4,500 B.P. $\pm$ 100 years	Swanson, Butler, & Bonnichsen 1964
10-CL-100, test pit 2, layer 8	3,170 B.P. $\pm$ 80 years	Swanson, Butler, & Bonnichsen 1964
Wilson Butte Cave, stratum B, upper level	940 B.P. $\pm$ 200 years	Butler, 1966
Wilson Butte Cave, stratum B, middle level	2,940 B.P. $\pm$ 200 years	Butler, 1966
Wilson Butte Cave, stratum C, upper level	6,850 B.P. $\pm$ 300 years	Butler, 1966 Gruhn, 1961, 1965
Wilson Butte Cave, stratum C, lower level	14,500 B.P. $\pm$ 500 years	Butler, 1966 Gruhn, 1965
Wilson Butte Cave, stratum E	15,000 B.P. $\pm$ 800 years	Butler, 1966 Gruhn, 1965

concave base/basal notch category described below. Points which seem to fall into this category were presented by Swanson, Powers, and Bryan (1964) in their illustrations of points from the Idaho sites of 10-OE-69, 10-TF-61, and 10-TF-108 (see Appendix XIII, pg. 14).

TERMINAL PALEO-INDIAN/ARCHAIC (9,000-3,000 B.P.)

Gruhn (1961:152) and others see the period from 10,000 B.P. to 7,000 B.P. as a period of increasing dryness which forced the big-game hunters off the Snake River Plain while other groups, used to the aridity, moved in. These latter groups subsisted by gathering vegetal materials and small-game hunting, although they did take bison when available. At the same time, however, groups related to the Old Cordilleran tradition remained in the more mountainous areas north of the Snake River, relying on fish, small game, and plants (Gruhn 1961:152). Yet another group, according to Gruhn (1961:153), may have come from the north and east, from the Great Plains, bringing with them a new projectile point type, the Bitterroot Side-notched. Swanson (1962:155), however, argues that the Bitterroot culture could have been the ancestor of the Desert cultures or developed from the same common base. He also states (1962:155), "The Bitterroot culture is the archeological counterpart to the Northern Shoshoni." Around 4,000 B.P., the climate in the region was probably much the same as it is today or, perhaps, even a little more dry.

Elko-Bitterroot Series (9,000-820 B.P.)

This series consists of two sub-series, Elko and Bitterroot, as previously noted (pg. 81, this chapter, and see Appendix XIII, pp. 8-9). However, in the Inter-mountain/Plateau region, the chronological ordering of the two is reversed from that in the Great Basin. Here, the Bitterroot appears to pre-date but overlap the Elko. Thus, the Bitterroot appears to be a Terminal Paleo-Indian/Archaic point series while the Elko is only an Archaic one.

Bitterroot (Northern) Side-notched (9,000-3,000 B.P.)

Gruhn (1961) calls this point type Northern Side-notched, but many other archeologists, particularly those specializing in the Great Basin, call it Bitterroot Side-notched. It has been discussed previously (pg. 83, this chapter) and does not need to be elaborated upon further here, except to point out that this is one of the most common point types found in the Inter-mountain/Plateau region (see Appendix XIII, pp. 14-15). Butler (1966) reports numerous surface finds in Idaho. It has been found in Oregon at Coyote Flat (Butler 1970a) and at many sites and on many surveys in Idaho: 10-OE-128 and 10-OE-129 (Gruhn 1964); Craters of the Moon National Monument (Sneed 1967); Jackknife Cave (Swanson & Sneed 1971); the National Reactor Testing Station (Butler 1970b); Hells Canyon (Warren, Sims, & Pavacic 1968); Grave Creek/Rocky Canyon Locality (Butler 1966); Weis Rockshelter (Butler 1962); the Railroad Ranch site (Swanson & Sneed 1967); the southwest Idaho survey sites (Swanson, Powers, & Bryan 1964): 10-TF-47, 10-TF-52, 10-TF-55, 10-TF-58, 10-TF-83, 10-TF-93, 10-TF-95, 10-TF-103, 10-TF-104, 10-TF-105, 10-TF-106, 10-TF-108, 10-TF-110, 10-OE-42, 10-OE-70, 10-OE-77, 10-OE-79, 10-OE-88, 10-OE-97, 10-OE-115, 10-CA-4, 10-CA-10, 10-CA-14, 10-CA-26, and 10-CA-115; Bureau of Land Management Salmon District's survey sites (Swanson, King, & Chatters 1969); the Birch Creek Valley's sites (Swanson, Butler, & Bonnicksen 1964): Cottontail Rockshelter (10-CL-23), Uncle Ike

Creek site (10-BT-52), 10-CL-35, and 10-CL-100; Wilson Butte Cave (Gruhn 1961); Shoup Rockshelters--Alpha and Beta (Swanson & Sneed 1966); and Weston Rockshelter (Jennings 1978). A variant of the Bitterroot Side-notched, the Salmon River variant, apparently differs from the regular variety by its distinctive basal notch (see Appendix XIII, pg. 15). These have been found during the BLM Salmon District survey (Swanson, King, & Chatters 1969), during the southwest Idaho survey (Swanson, Powers, & Bryan 1964), Shoup Rockshelter Alpha (Swanson & Sneed 1966), and possibly Wilson Butte Cave (Gruhn 1961).

Haskett (8,500-7,000 B.P.)

This projectile point has two forms, Type 1 and Type 2. Type 1 is a large lanceolate point which is broadest and thickest near its point tip and it has a long, edge-ground basal section which narrows to a round base (Butler 1965a:6). It is similar to points found in Cougar Mountain Cave II, 10-PR-31, Thorn Creek Reservoir, and level 3a at Veratic Cave (Butler 1965a:7). Haskett Type 1 points were shown to Forbis, Wormington, and Irwin-Williams, all of whom saw a similarity to Agate Basin points, although Irwin-Williams felt that the flaking techniques were different (Butler 1965a:7). There is also some resemblance to the Birch Creek points and, in some cases, a strong resemblance to Hell Gap points (compare Appendix XIII, pp. 15-16 with Appendix XIII, pp. 2-3 and 14). Type 1 points have been reported from Coyote Flats in Oregon (Butler 1970a), and several locations in Idaho: the Cooper's Ferry site (Butler 1969), the National Reactor Testing Station (Butler 1970b), Halls Canyon (Warren, Sims, & Pavacic 1968), the Railroad Ranch site (Swanson & Ranere 1970, 10-OR-129 (Gruhn 1964), and the Haskett site (Butler 1965, 1967).

Type 2 points differ from Type 1 points in several aspects. They are usually larger and heavier, the blade and basal sections are approximately equal in length, and the base may be rounded or irregularly straight (Butler 1965:7). This type shows an even stronger resemblance to Agate Basin points (compare Appendix XIII, pg. 15 with Appendix XIII, pg. 2). They have been found at the Railroad Ranch site (Swanson & Sneed 1967), the Haskett site (Butler 1965), and Shoup Rockshelter Alpha (Swanson & Sneed 1966).

Haskett points may have also been found in Birch Creek Valley sites (Swanson & Bryan 1964), where they were called Agate Basin and Hell Gap.

Cascade Phase (8,000-5,000 B.P.)

This is the second phase in the Leonhardy and Rice (1970) chronology. The main diagnostics of this phase are the Cascade point and the Cold Springs Side-notched point. The Cascade phase is divided by Leonhardy and Rice (1970:6) into two subphases, the earlier containing only the Cascade point and the latter having both the Cascade and the Cold Springs Side-notched. Sites having only the earlier sub-phase include Ash Cave, 45WT31, and Wexpuenime (45AG61); sites with both sub-phases--Windust Cave, Marmes Rockshelter, Granite Point Locality, and Thorn Thicket (45WT36); and sites with only the later sub-phase--Tucannon (45CO1), Votaw (45PR36), and 45WT7 (Leonhardy & Rice 1970:6). Sites at which the phases are not specified include Marmes Rockshelter (Butler 1969), Ash Cave (Butler 1962), and the Birch Creek Valley sites (Swanson & Bryan 1964).

Cascade

This is a lanceolate form (see Appendix XIII, pg. 15) which is either bi-pointed or pointed at one end and rounded at the other; a basal section which is about one-third the length of the point, usually not edge-ground; and about 25 percent having serrated edges (Butler 1962:36; Lynch, Wilkinson, & Warren 1965:36).

Cold Springs Side-notched

This point (see Appendix XIII, pg. 15) has a lanceolate side-notched form which is broad in relation to its length; a stem which is narrower than the blade above the side notches; a blade which is triangular in shape with convex edges; and a base which can be straight, irregular, or convex.

ARCHAIC (7,850-200 B.P.)

As was noted above, the period from 10,000 B.P. to 7,000 B.P. was a period of increasing aridity in this region. The period between 7,000 B.P. and 5,000 B.P. was one of continued semi-arid conditions but by 4,500 B.P. a shift to a slightly more moist climate was occurring and with it came a shift from large- to medium-sized, side-notched projectile points to large- and medium-sized corner-notched points and strong ties to both the Plains and the Great Basin continued (Gruhn 1961:153-154).

Black Rock-Humboldt-McKean-Pinto Basin Series (7,850-2,500 B.P.)

The ties with both the Great Plains and the Great Basin can be seen in this series with the Black Rock, Humboldt, and Pinto Basin sub-series being derived from the desert and basin and the McKean from the Plains. In many cases the morphology of the points was so similar as to be indistinguishable, hence, one sub-series called McKean-Humboldt-Pinto Basin.

Black Rock Concave-base (7,850-2,650 B.P.)

This type was reported earlier (pg. 85, this chapter, and see Appendix XIII, pp. 10 and 16) and will not be redescribed here. This type was identified at the Warner Valley site in Oregon (Weide & Weide 1969) and may have possibly been present in Shoup Rockshelter Beta in Idaho (Swanson & Sneed 1966).

Humboldt Subseries (3,920-3,100 B.P.)

This sub-series contains two types, the Humboldt Concave-base and the Humboldt Basal-notched. Both have been described previously (pg. 85, this chapter, and see Appendix XIII, pp. 10, 11 and 16) and those earlier comments need not be repeated again.

Humboldt Concave-base

This type was found at Coyote Flat in Oregon (Butler 1970a) and in Owl Cave (Butler 1968) and Shoup Rockshelter Beta (Swanson & Sneed 1968) in Idaho.

Humboldt Basal-notched

The basal-notched point was also found at Coyote Flat in Oregon (Butler 1970a) and near Glenn's Ferry in Idaho (Kehoe 1955).

McKean Lanceolate (5,000-2,500 B.P.)

This type was defined earlier in this chapter (pp. 69-70 and 86, and see Appendix XIII, pp. 5 and 16) and those previous comments will not be repeated here. The McKean Lanceolate is one of the projectile point types felt to demonstrate the ties the Inter-mountain/Plateau region had with the Great Plains. It was reported during the surveys of southwestern Idaho (Swanson, Powers, & Bryan 1964) and the National Reactor Testing Station (Butler 1970b) and at the Idaho sites of Wilson Butte Cave (Gruhn 1961; Butler 1966), Cottontail Rockshelter (10-CL-23) in the Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964), and Shoup Rockshelter Beta (Swanson & Sneed 1966).

Humboldt-McKean-Pinto Basin (undifferentiated) Sub-series (undated)

This catch-all sub-series contains most lanceolate forms which have basal indentations and can not be assigned with any certainty to a particular type. The points in this category may or may not have shoulders or stems. Among the sites reporting these points (see Appendix XIII, pg. 17) were Coyote Flat in Oregon (Butler 1970a) and Wilson Butte Cave in Idaho (Gruhn 1961).

Pinto Basin (5,050-2,750 B.P.)

This is another series common to the Great Basin. Neizer and Hester (1978:5) report a date for this sub-series of 7,250 B.P. in Weston Rockshelter, Idaho, but this date seems rather early and was not specific as regards which type in the series was being dated.

Pinto Basin Barbed

The description of this type was given previously (pg. 83, this chapter, and see Appendix XIII, pp. 9 and 17) and will not be redescribed here. Sites reported to have had this type include Coyote Flat in Oregon (Butler 1970a) and 10-CA-32 (Swanson, Butler, & Bonnicksen 1964) and Wilson Butte Cave (Gruhn 1961) in Idaho.

Pinto Basin Willow-leaf

The definition of this type was outlined on page 84 of this chapter (see Appendix XIII, pp. 9 and 17 also) and will not be commented upon further here. It does not appear to have been common anywhere and has been reported only at Wilson Butte Cave (Gruhn 1961) in the Inter-mountain/Plateau region.

Pinto Basin Shoulderless

This is another uncommon form in this sub-series which has also been discussed previously (pg. 84, this chapter, and see Appendix XIII, pp. 9 and 17) and upon which will not be further elaborated here. It, too, was reported at only one location, Coyote Flat in Oregon (Butler 1970a).

Pinto Basin Square-shoulder

This type is more often found and was reported upon here on page 84 (see also Appendix XIII, pp. 9 and 17). It will not be redescribed here. Butler (1970a) reported it at Coyote Flat in Oregon, and it was found on several Idaho sites and surveys: 10-FN-25 (Swanson & Ranere 1970), Wilson Butte Cave (Gruhn 1961), the BLM Salmon District survey (Swanson, King, & Chatters 1969), and in the Birch Creek Valley (Swanson & Bryan 1964).

Pinto Basin Sloping-shoulder

This is probably the most commonly reported type in this sub-series. It was described earlier (pg. 84, this chapter, and see Appendix XIII, pp. 10 and 17) and the description does not need to be repeated here. Butler (1970a) found the type at Coyote Flat in Oregon and it has been reported from a number of Idaho sites and surveys: Hells Canyon (Warren, Sims, and Pavacic 1968), Owl Cave (Butler 1968), Wilson Butte Cave (Gruhn 1961), Shoup Rockshelter Beta (Swanson & Sneed 1966), in the Birch Creek Valley (Swanson, Butler, & Bonnichsen 1964), the BLM Salmon District survey (Swanson, King, & Chatters 1969), and the southwestern Idaho survey sites (Swanson, Powers, & Bryan 1964)--10-TF-62, 10-TF-104, and 10-TF-106.

Tucannon Phase (5,200-2,500 B.P.)

Leonhardy and Rice (1970:11) note that there is a hiatus in the archeological record of their part of the Inter-mountain/Plateau region and that they are not exactly sure when the Cascade phase ended and the succeeding Tucannon phase began. They reported that, as of 1970, Tucannon phase components were known from the Tucannon site, Marmes Rockshelter, and Granite Point. The diagnostic artifacts of the phase are two projectile point types, a corner-notched variety and a contracting-stem variety (see Appendix XIII, pg. 17).

Unnamed Corner-notched

This type is considered by Leonhardy and Rice (1970:11) to be a possible crude forerunner of the "Snake River Corner-notched" of later phases in their proposed cultural sequence. This type has a blade which is triangular and is relatively broad compared to its length; has convex blade edges; and an expanding stem with a convex base. One form has side notches which are so low on the blade as to almost give the appearance of corner notches.

Unnamed Contracting-stem

This type has a short, broad blade; shoulders with varying prominence; and a contracting stem (Leonhardy & Rice 1970:11).

Elko-Bitterroot Series (9,000-820 B.P.)

Elko Sub-series (4,000-820 B.P.)

As was the case of the other Great Basin sub-series, the Pinto Basin Sub-series, the Elko Sub-series is quite commonly found in the southern part of the Inter-mountain/Plateau region.

Elko Eared

A presentation of the characteristics of this type were given earlier (pg. 82, this chapter, and see Appendix XIII, pp. 9 and 18) and those previous comments will not be repeated here. The Elko Eared point is likely the most commonly found in this sub-series. It has been reported at Coyote Flat in Oregon (Butler 1970a) and from numerous Idaho sites and surveys: Jackknife Cave (Swanson & Sneed 1967); both Shoup Rockshelters, Alpha and Beta (Swanson & Sneed 1966), the National Reactor Testing Station (Butler 1970b), in the Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964)--Cottontail Rockshelter (10-CL-23), Bobcat Rockshelter (10-CL-11), 10-CL-46, and 10-CL-100; and the southwestern Idaho survey sites (Swanson, Powers, & Bryan 1964): 10-OE-67, 10-OE-78, 10-OE-79, 10-OE-83, 10-OE-97, 10-OE-98, 10-OE-115, 10-OE-124, 10-TF-39, 10-TF-94, 10-TF-104, 10-TF-108, 10-TF-110, 10-TF-113, 10-CA-32, and 10-CA-33.

Elko Corner-notched

The Elko Corner-notched point is the second-most commonly found point of this sub-series. Like all the others in this sub-series, the description was given earlier (pg. 82, this chapter, and see Appendix XIII, pp. 8 and 18) and will not be redescribed at this point. Butler (1970a) found the point at Coyote Flat in Oregon and it has been found at a number of localities in Idaho including: the National Reactor Testing Station (Butler 1970b); Quill Cave or 10-CR-197 (Butler 1971); the Railroad Ranch site (Swanson & Sneed 1967); both Shoup Rockshelters, Alpha and Beta (Swanson & Sneed 1966); the southwestern Idaho survey sites (Swanson, Powers, & Bryan 1964)--10-OE-73 and 10-OE-77; and in the Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964)--Cottontail Rockshelter (10-CL-23), 10-CL-35, and 10-CL-100.

Elko Contracting-stem

This type, outlined previously (pg. 83, this chapter, and see Appendix XIII, pp. 8 and 18), is least commonly found of the sub-series. Only Quill Cave (Butler 1971) has any reported.

Elko Split-stem

The discussion of this type is found on page 82 of this chapter (see also Appendix XIII, pp. 8 and 18) and will receive no further comments here. It is slightly more commonly found than the Contracting-stem type, being described at Bobcat Rockshelter (10-CL-11) in the Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964) and the Shoup Rockshelter Alpha (Swanson & Sneed 1966), both in Idaho.

Harder Phase (2,500-700 B.P.)

This phase succeeds the Tucannon phase in Leonhardy and Rice's (1970) sequence. It consists of two sub-phases, an earlier one usually represented by hunting camps and containing a large, basally- or corner-notched point called the Snake River Corner-notched and a later sub-phase with pithouse villages and early Columbia Valley Corner-notched points (Leonhardy & Rice 1970:14). The earlier sub-phase is reported at 45GA17 and 45WT41 (Granite

Point Locality), the later at 45WT39 (Wawawai) and 45FR40 (the Harder site), both at 45FR39, and two sites unspecified as to sub-phase, 45FR93 or Three Springs Bar and 45CO1 or the Tucannon site (Leonhardy & Rice 1970:14).

Snake River Corner-notched

This is a large, basally- or corner-notched point which has a broad, triangular blade with convex edges; a slightly expanding or parallel-sided stem with a straight or convex base. If basally-notched, the tange formed by the notching range in size from large to medium, and medium to small if corner-notched. This type resembles the Elko Corner-notched to a degree (compare Appendix XIII, pp. 8 and 18).

early Columbia Valley Corner-notched

This type was named by Warren (1968:8), who combined the Middle Columbia Basal-notched and the Wallula Rectangular-stemmed, types which are described below (also see Appendix XIII, pp. 18 and 19), into a single type. The Columbia Valley Corner-notched point (Appendix XIII, pg. 18) shows much finer workmanship and, generally, is a much smaller point. However, the blade is still rather broad in terms of the length of the point. It could be either basally- or corner-notched with a slightly expanding or parallel-sided stem and a usually straight base, although the convex base may also occur. Notches range from large to small and tanga from large to non-existent.

Avonlea (1,900-600 B.P.)

The Avonlea point was described before (pp. 72-73, this chapter, and see Appendix XIII, pp. 7 and 19) and will not be redescribed here. However, a form, the Blue Dome point, has been found in Idaho which, initially, at least, was thought to be Avonlea and is still considered by some to be a variant. True Avonlea points were reported by Butler (1970b) at the National Reactor Testing Station and in the Birch Creek Valley (Swanson & Bryan 1964). A possible Avonlea may have been present in Shoup Rockshelter Alpha (Swanson & Sneed 1966).

Blue Dome

As stated above, this was thought to be an Avonlea or variant form. It is a side-notched point with the side notches parallel with and close to the base which is usually straight but may be concave; the blade is small, thin, triangular, slightly diamond-shaped in cross-section, and slender in relation to its length and has excurvate sides (Swanson & Butler 1964:9). Kehoe, after examining several examples of the Blue Dome point, felt it was not the same as the Avonlea (Swanson & Butler 1964:9). These points were found at the Birch Creek Valley sites (Swanson, Butler, & Bonnicksen 1964): Bobcat Rockshelter (10-CL-11), Cottontail Rockshelter (10-CL-23), and 10-CL-100.

Desert Complex (1,250 B.P.-Historic)

The description of this Great Basin complex has already been given (pp. 87-89, this chapter, and see Appendix XIII, pp. 11, 12, and 19) and its relationships to the Great Plains sequences noted.

Desert Side-notched

General variety

This variety is described on page 87, this chapter, and will not be commented upon further here. It has been recorded at a number of Idaho sites: Challis Bison Jump or 10-CR-196 (Butler 1971); Wilson Butte Cave (Gruhn 1961); in Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964)--the Desert Zone site (10-BT-51), 10-CL-35, and 10-CL-100; and on the BLM Salmon District survey (Swanson, King, & Chatters 1969).

Redding variety

This variety was also outlined on page 87, this chapter, and will not be discussed again here. It was found during the National Reactor Testing Station survey (Butler 1970b), in Hells Canyon (Warren, Sims, & Pavacic 1968), at the Challis Bison Jump (Butler 1971), and in the Birch Creek Valley sites (Swanson, Butler, & Bonnicksen 1964)--Bobcat Rockshelter (10-CL-11) and 10-CL-100.

Sierra variety

This point has also been reported earlier (pg. 87, this chapter) and need not be redescribed here. Idaho sites and surveys on which it has been found include: the Challis Bison Jump (Butler 1971), Wilson Butte Cave (Gruhn 1961), the National Reactor Testing Station (Butler 1970b), Craters of the Moon National Monument (Sneed 1967), and in the Birch Creek Valley (Swanson, Butler, & Bonnicksen 1964)--the Desert Zone site (10-BT-51), Uncle Ike Creek site (10-BT-52), and 10-CL-100.

Delta variety

As was the case with the other varieties of the Desert Side-notched point, the Delta variety was reported previous in this chapter (pg. 87) and will not be elaborated upon further here. This least commonly found point in the series was discovered on only the southwestern Idaho survey (Swanson, Powers, & Bryan 1964) and at the Challis Bison Jump (Butler 1971).

Cottonwood Triangular

This series in the Desert Complex was also presented earlier (pg. 87, this chapter) and the description need not be repeated here. This projectile point type was reported at the National Reactor Testing station (Butler 1970a) and at both Shoup Rockshelters, Alpha and Beta, (Swanson & Sneed 1966).

Rose Spring Series

Rose Spring Contracting-stem

The description of this point type was given on page 89 of this chapter and does not need to be described again here. As was the case in the Great Basin, this point type is not very common in the Inter-mountain/Plateau region, being found only at Wilson Butte Cave, which according to Gruhn (1961:135-136) seems to have had less relationship with the rest of the Inter-mountain/Plateau region than it did with the northern Great Basin.

Rose Spring Expanding-stem

This point type was also outlined on page 89 of this chapter and will not be commented upon further here. Also less commonly found, it too was reported only from Wilson Butte Cave (Gruhn 1961).

Eastgate Series

Eastgate Expanding-stem

Discussed earlier (pg. 89, this chapter), the description of this projectile point will not be elaborated upon further here, except to note that both the Eastgate and Rose Spring Expanding-stem points resemble many if the Middle Columbia Basal-notched points and some of the Wallula Rectangular-stemmed points (compare Appendix XIII, pg. 12 with pp. 18-19), both of which are described below. Eastgate Expanding-stem points were found on the Snake River during the Hells Canyon excavations (Warren, Sims, & Pavesic 1968).

Eastgate Split-stem

Like the expanding-stem variety in this series, this type was reported previously in this chapter (pg. 89) and need not be redescribed here. Also like the expanding-stem, it appears in the literature only at the Hells Canyon excavations (Warren, Sims, & Pavesic 1968).

Piquin Phase (700-250 B.P.)

As Leonhardy and Rice (1970:17) note, the understanding of the later pre-history of the Lower Snake River is very limited. Indeed, the only site to provide any detailed data for this period is Wuxpuxime (45GA61), an apparently stratified pithouse village. Diagnostic of this phase are small, delicate, corner- and basally-notched points, the Middle Columbia Basal-notched and the Wallula Rectangular-stemmed, which, as noted above, Warren (1968:8) lumps together as Columbia Valley Corner-notched.

Middle Columbia Basal-notched

This point can be either basally- or corner-notched; is broad in relation to its length; has either a parallel-sided or expanding stem with a base which may be straight or convex and may have a small notch; has shoulders formed by the notching which produce exaggerated barbs, often as long as the stem; and has a small, triangular blade with the edges which are straight or, more often, concave, with the greatest concavity nearest the barbs (Lynch, Wilkinson, & Warren 1965:35; Warren, Sims, & Pavesic 1968:7). The Middle

Columbia Basal-notched point (see Appendix XIII, pp. 18 and 19) has been found at Wapuanime (Leonhardy & Rice 1970) and Wenas Creek (Warren 1968) in Washington, and at several Idaho sites: 10-IH-78 (Gaarder 1967), 10-CW-1 (Lynch, Wilkinson, & Warren 1965), Shoup Rockshelter Beta (Swanson & Sneed 1966), and in Hells Canyon (Warren, Sims, & Pavesic 1968). A variant, the Hermit variety (see Appendix XIII, pg. 18), differs from the main form only in the fact that the basal notches are shallower (Lynch, Wilkinson, & Warren 1965:35) has been reported in Hells Canyon (Warren, Sims, & Pavesic 1968). Gaarder (1967:40) differentiates the Hermit variety from the other Middle Columbia Basal-notched points by the presence of the notch in the base. A sub-variety of the Hermit variety, also found in Hells Canyon, is asymmetric, having only one barb (Lynch, Wilkinson, & Warren 1965:35).

Wallula Rectangular-stemmed

This is also a small, triangular, corner-notched projectile point which is relatively slender in relation to its length and which has a parallel-sided or expanding stem with a straight or slightly convex base; a blade whose edges may or may not be serrated and may be straight or convex but are more often concave, with the greatest concavity nearest the barbs formed by the corner notches; and shoulders which usually are straight but may have short barbs (Lynch, Wilkinson, & Warren 1965:35). Both Gaarder (1967:40) and Warren, Sims, & Pavesic (1968:7) add that the base may have a small notch in it. The point (see Appendix XII, pp. 18 and 19) has been found at Wapuanime (Leonhardy & Rice 1970) and Wenas Creek in Washington and in Idaho: Grave Creek/Rocky Canyon Locality (Butler 1966), Hells Canyon (Warren, Sims, & Pavesic 1968), 10-IH-78 (Gaarder 1967), Challis Bison Jump (Butler 1971), and 10-CW-1 (Lynch, Wilkinson, & Warren 1965). A variant of this point, the North Fork variety (see Appendix XIII, pg. 18), differs from the main form in that it has deeply serrated edges (Lynch, Wilkinson, & Warren 1965:35). It was recorded at 10-CW-1 (Lynch, Wilkinson, & Warren 1965).

SUMMARY

It is hoped that the preceding three sections have provided a framework against which to view the prehistoric occupations of the area around the Fontenelle Reservoir and the Seedskadee Wildlife Refuge. In those sections, more than 90 projectile point types and varieties were discussed and over 850 examples of those point types and varieties are illustrated in this chapter or in Appendix XIII. Obviously, not every projectile point type described in the first three sections of this chapter nor evidence of the prehistoric cultural groups which might have used those point types is to be found in the Seedskadee region. However, the possibilities of such must be at least considered when examining the prehistory of such an area. In reviewing these varied projectile point types and comparing them with the materials found during the 1983 Seedskadee Project survey and remembering the different names which identical points can have in different but contiguous geographical areas, it is both easy to understand and difficult to determine exactly what the origins of the archeological manifestations encountered there are.

As will also be seen in the historic period, the Seedskadee region was a natural crossroads in southwestern Wyoming. While somewhat of a backwater of the northwestern Great Plains, there certainly were no major impedences

from the Plains to this region to hinder the large game animals or their predators, which included man. As Butler (1965a:8-9; this chapter, pg. 97) noted, one route from the Snake River Plain and the entire interior Pacific Northwest passed right through the Black's Fork of the Green River, just southwest of the project area. Access from the Great Basin also was relatively unimpeded, either following the canyons eastward from Ogden and Salt Lake City area (as present-day Interstate 80 does) or coming northward along the Green River from the area near Green River, Utah.

HISTORIC OVERVIEW

It is an unfortunate occurrence in most discussions of the culture history of an area or region that the prehistory and the history of that area or region are not viewed or, at least, are not presented as a continuum. Instead, the prehistory, which, of course, concerns only the Native American cultures from their earliest documented sites through the proto-historic period, forms one discussion. The history is dealt with separately and the discussion is generally seen against a Euro-American framework, with the Native American considered only in terms of their confrontations with the Euro-American society. While the proto-historic and historic Native American cultures of the Seedskadee region will not be discussed in any great detail here, they will also not be delegated into limbo either.

Gruhn (1961:154) suggests that Shoshonean-speakers were moving out of the Great Basin into southern Idaho by 650 B.P. and, in the late prehistoric period, they were continuing on eastward onto the Great Plains. It seems reasonable to assume also that the same mechanisms were also bringing these groups into southwestern Wyoming, either through Idaho or directly from Utah. Reher (Ziemens & Walker 1977b:131-132) talks of a "Little Ice Age" between 450 B.P. and 150 B.P. which resulted in increases in moisture, grass, and buffalo on the Plains. This, in turn, according to him, resulted in groups, in addition to the small resident population already there, moving out onto the Plains from Canada, from the Missouri River Valley, and from the Great Basin and Plateau areas. Reher (Ziemens & Walker 1977b:148) feels that the Shoshoni (or Snake) and the Comanche were Gruhn's migrants from the Great Basin and that they moved out into the Wyoming basins between 550 and 350 B.P. Sometime between 550 and 250 B.P., the Crow began moving westward along the Yellowstone River from the east, as Reher interprets the archeological record (Ziemens & Walker 1977b:148), and Plains Apaches were to be found in the Powder River Basin at this time. The Shoshoni and the Comanche were the first to acquire the horse, probably from the Spanish in Santa Fe between 350 and 250 B.P. (Gruhn 1961:154-155; Reher in Ziemens & Walker 1977b:149; Zier & Peebles 1982:28) and they used them to great advantage, the Shoshoni against their neighbors to the north and east, pushing the Crow back down the Yellowstone, and the Comanche against the Apaches to the east and south, forcing that group southward. By 250 to 150 B.P., the Comanches ruled the Plains from southern Wyoming to Texas and the Shoshoni continued their push northeastward, fighting pitched battles with the Blackfoot and Piegan in Montana and Saskatchewan. Also around 250 B.P., the Cheyenne began moving westward and the Arapahoe southwestward onto the Plains before the pressures of the Sioux in the eastern Dakotas and Minnesota, who themselves were being forced west by the Chippewas (Reher in Ziemens & Walker 1977b:152). Reher (Ziemens & Walker 1977b:152), Gruhn (1961:154-155), and Zier and Peebles (1982:28) note that after 150 B.P.,

when the Blackfoot, Crow, and other groups obtained sufficient horses and firearms, the Shoshoni were gradually pushed back, so that by 100 B.P., they were found primarily in central and western Wyoming and southern Idaho. The group in Wyoming, later called the Wind River Shoshoni, were alternately allied with or hostile to the Crow to their north from 150 to 100 B.P. Reher (Ziemens 1977a:78) erroneously interprets a description by the priest, Father DeSmet, of the meetings he had at the Green River Rendezvous in the early 19th Century with the Shoshoni and Flathead as a battle fought between the Shoshoni and the Blackfoot in the Green River Valley. What DeSmet had described (Chittenden and Richardson 1905:219-220) was: 1) his observations of a Shoshoni leader at the rendezvous on the Green River preparing his men for a war party against the Blackfoot and 2) the accounts of the Flatheads of a battle they had fought against the Blackfoot elsewhere. It should be noted that the Flathead were often allied with the Shoshoni, primarily for the protection of the Flathead. The Ft. Laramie Treaty of 1851, arranged by the U.S. government, was hoped to end the inter-tribal warfare by establishing tribal boundaries. The Shoshoni were not included in the provisions of this treaty, however, and their boundaries were laid out more or less by default (Reher in Ziemens & Walker 1977a:82-83). The peace between the tribes only lasted two years. However, with Euro-American emigrants criss-crossing the area after 100 B.P. and the Union Pacific Railroad being built, game movements were disrupted and increased intrusions from the Euro-Americans gave the Native Americans a new, common enemy to confront.

Gruhn (1961:140-141) described several of the Idaho Shoshoni groups. Of some interest here, are Ft. Hall Shoshoni and the Lemhi Shoshoni. The Ft. Hall group was apparently a combined group of Shoshoni and Bannock which had a great number of Plains traits. They had gotten horses early, around 250 B.P., probably from the Utes in western Colorado and their seasonal rounds took them from the Idaho/Oregon border to the Montana Plains. Evidently bison had become extinct in the Snake River Plain by 100 B.P. and, according to Gruhn (1961:140), it was necessary to travel in large groups in the late summer to the Montana and Wyoming Plains, a favorite hunting area being south of the Musselshell River in central Montana, 50 miles north of Billings. The Lemhi Shoshoni, like the Ft. Hall, were mounted bison hunters who traveled to the Plains in a large group in the summer to hunt. They also, apparently, were the first Shoshonean-speakers that the Lewis and Clark expedition met in 1804.

Sites of specific importance to the Seedsakdee region include the Shoshoni wicki-up village Cowie reported seeing in 1812 on the east fork (possibly the Big Sandy Creek?) of the Green River (Zier & Peebles 1982:28); an oval juniper corral--the Ft. Bridger Antelope Trap, evidence of antelope procurement just over 100 years ago (Zier & Peebles 1982:28); the Eden-Farson site--postholes and house outlines of 12 lodges used by the Shoshoni around 230 B.P. (Zier & Peebles 1982:29), and two sites on the eastern edge of the Rock Springs Uplift (48SW336 and 48SW589--Ice Cave) which have both Euro-American trade goods and chipped stone (Zier & Peebles 1982:29).

The Lewis and Clark expedition marks the beginning of the Historic Period in this region, although there probably had been contacts with Spanish, French, British, and American traders during the previous century. A robust fur trade began as a result of the Lewis and Clark journey, however. The first of the now legendary "mountain men" came through South Pass in 1824 as part

of William Ashley's trapping company. The first rendezvous was planned to be held in 1825 at the confluence of the Green River and Henry's Fork, just north of the present-day Utah/Wyoming state line but was later moved 25 miles upstream on Henry's Fork (Purdy 1962:4-5). One of the earliest trading posts in the region was Ft. Crockett (see Figure 6-23), according to Purdy (1962:7), which was supposedly located in Brown's Hole in northwestern Colorado. It was built by three men, Sinclair, Craig, and Thompson, in 1837, but lasted only a few years. Purdy (1962:7) says Farnham reported passing by it in 1841, but it was in ashes when Fremont marched through in 1843. This outpost was more closely linked with the Santa Fe trade than the St. Louis trade (Purdy 1962:7).

Ft. Bridger, an oasis on the California and Oregon Trails, was established in 1842 by mountain men Jim Bridger and Louis Vasquez (Purdy 1962:12). There Bridger traded his cattle to the emigrants for their cattle, which were worn out by the trip from St. Louis and other points east. He then rested and fattened the cattle up on the grasslands around the fort in preparation for the next wagon train (Purdy 1962:12), thus beginning the cattle industry in southwest Wyoming. Bridger also introduced the first sheep and goats at the fort in 1846 and they adapted themselves excellently to the area (Zier & Peebles 1982:263). In the mid-1850s, the post trader and sutler at Ft. Bridger, Judge W. A. Carter, took up sheep raising, an industry he continued for ten years. With this exception, prior to 1865, the majority of the sheep seen in Wyoming were just passing through on their way to California and Oregon. In 1872, John "Sheep" Smith became the first sheepman in Lincoln County, when he established himself on a branch of the Oregon Trail on Fontenelle Creek, 60 miles north of Ft. Bridger. Several other sheep operations came by 1878, but by 1880 only one still remained (Zier & Peebles 1982:263). During the 1870s and the 1880s, after the arrival of the railroad which made transport of cattle easy, quick, and economical, the cattle industry dominated southwestern Wyoming (Zier & Peebles 1982:263). Numerous cattle companies had been formed and many belonged to foreign and/or absentee owners. After the disastrous winter of 1886-1887, which severely damaged the cattle industry and killed an estimated 150,000 head of cattle, there was a shift away from the big cattle companies toward smaller ranches and many of those ranchers also switched to sheep raising instead. Sheep ranching started to boom in the 1890s and a woolen mill was set up at Afton, in the Star Valley in 1897 (Zier & Peebles 1982:267) while further to the south, the sheep industry centered on Evanston. In the early 20th century, sheep raising was to prove more profitable than cattle, but, during World War I and shortly thereafter, the cattle industry improved (Zier & Peebles 1982:268). Severe droughts around 1919 and a depression caused setbacks in both the sheep and cattle industries as well as homesteading which had begun in as a result of the Stockraising Homestead Act of 1916 (Zier & Peebles 1982:268-269).

Beginning in the 1840s, people east of the Missouri and Mississippi Rivers started to cross the United States in order to achieve what they considered their dreams. Many were bound for California and the gold fields, others for Oregon and new homesteads. Some of the trails they followed (see Figure 6-23) saw such use as to be visible today, over a hundred years later. Most saw traffic for only a short time: the Oregon Trail--1843-1845 and the Mormon Trail--1847, for example. Some, not as well travelled, are not as clearly documented, however. While most maps show the Cherokee Trail, named

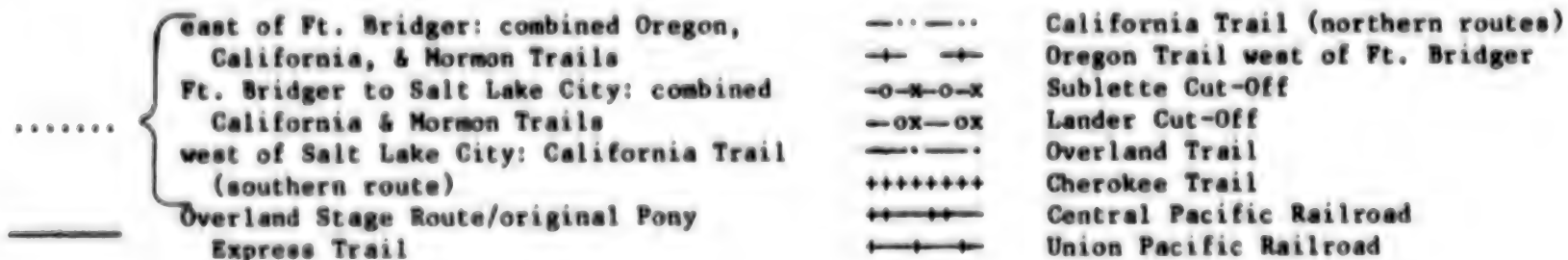
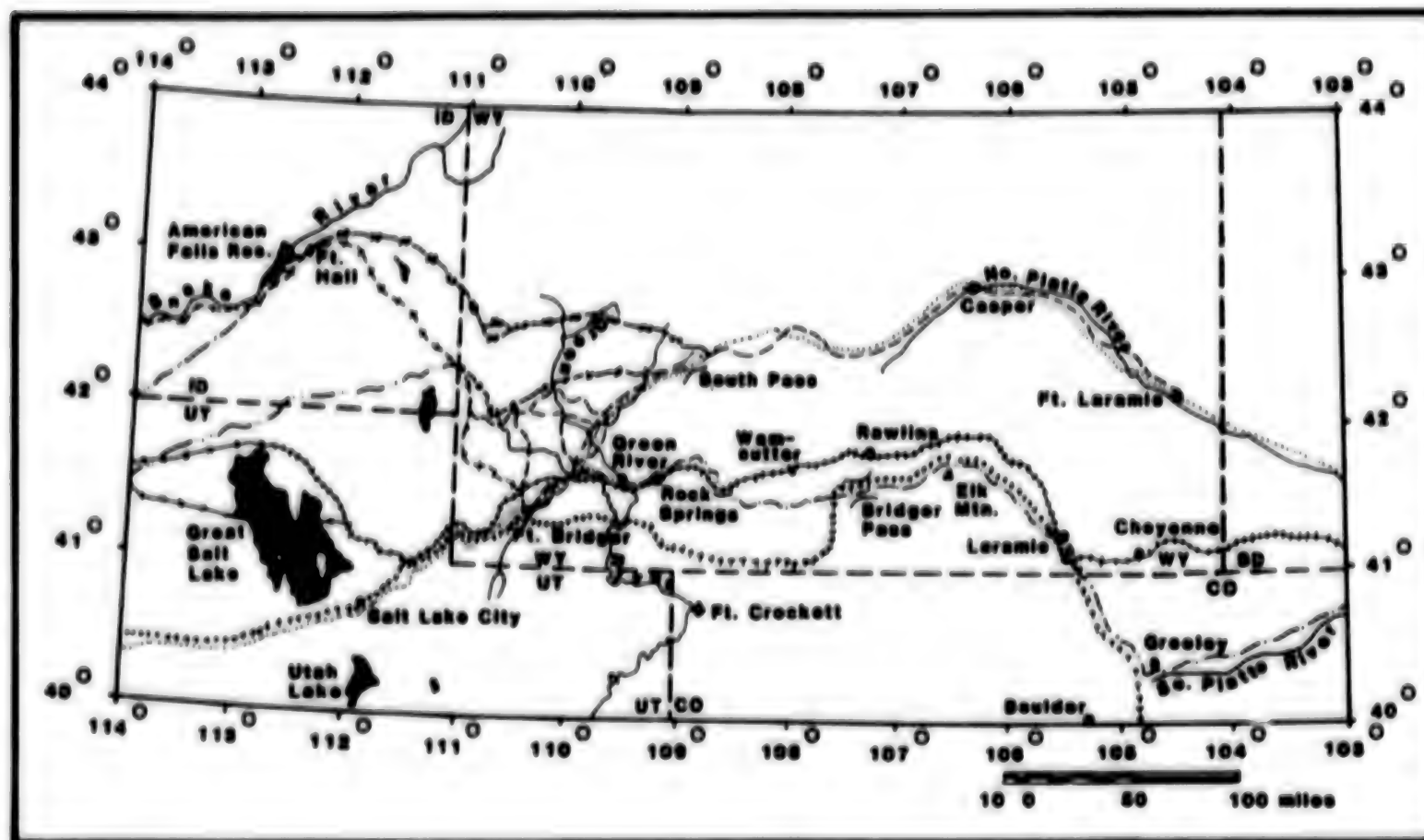


Figure 6-23. Historic Trails and Railroads.

for a group of Cherokee Indian gold miners from Georgia who travelled it in 1849, following the Overland Trail through Wyoming, Purdy (1962:15), citing a diary of one of the travellers, argues that it dropped south from the Overland Trail after passing through Bridger Pass and then paralleled it until reaching Ft. Bridger.

The Pacific Railway Acts of 1862 and 1864 called for a railroad from the Missouri River to the Pacific coast but until 1865, no adequate route had been found. By late 1868 or early 1869, the Union Pacific Railroad had reached the Green River. Beginning in 1867, the Union Pacific had been mining coal at Rock Springs and, by 1891, a million tons of coal was being extracted annually by a variety of ethnic groups: Celtic, Mediterranean, Slavic, and Chinese. Mining operations have continued off and on there to the present. Coal mining also started in the Evanston area in 1868, but numerous accidents and explosions occurred, and the mines finally closed in 1900, after a disastrous fire.

The first oil well in Wyoming was drilled at Sulphur Creek in 1850. Judge Carter drilled for oil at Ft. Bridger in the 1860s and other wells were drilled in 1876 and 1884, but none produced very much. Major finds were made in the early part of the 20th century and production rose and fell until after World War II, when the industry boomed.

Mining, primarily copper and coal, enjoyed relative prosperity during the latter decades of the 19th century, but have gone through a series of ups and downs in the 20th century. After World War II, mining activity in the Seedeekadee area was for various minerals: trona, uranium, bentonite, soda ash, potash, oil shale, asbestos, and cronite in Sweetwater and Carbon Counties.

The period of westward expansion of the Euro-Americans: the emigrants to California and Oregon, the gold miners to California, and later to Colorado, South and North Dakota, and Wyoming, and the railroad crews of the Union Pacific, was certain to affect the Native Americans adversely and it should not be too surprising that the Indians reacted in a manner which captured the imaginations of the Americans east of the Mississippi and of the Western Europeans for generations. This reaction by the Indians was one of confrontation. They saw all the Euro-American incursions into areas which they considered their territories as disruptive to the wildlife upon which their lifeways depended. Prior to 1850, warfare had been pretty much restricted to inter-tribal battles. The Arapahoe and the Cheyenne were in the North Platte area, the Shoshoni ranged from the Green River to the Sweetwater River and occasionally as far as the North Platte, and the Utes came up to the southern fringes of Wyoming. The Ft. Laramie Treaty of 1851 was an attempt to make the various tribes cease this inter-tribal warfare. The tribes were to be compensated for damages to their lands by the emigrants passing through. They were also supposed to respect boundaries of other tribes or nations, although they were not ceding away any lands. They were also to allow the United States to build roads and military posts on their lands. Hunting areas could be used by whomever had traditionally hunted there. The peace was to last a scant two years.

By then, however, pressures between the Indian and the whites was building. A synopsis of the Euro-American/Native American confrontations is found in Table 6-3. In 1853, a party of whites, trying to arrest a member of a

Minniconjou Sioux village, killed three of the Sioux. One year later, a visitor to a Brule Sioux village killed a Mormon cow. Troops under the command of Lt. Gratton tried to arrest this man. However, lacking the diplomacy to accomplish the task peacefully and desiring to be noticed by his superiors, led the lieutenant and his 29 men to be killed. Retaliation came in 1855 when Gen. Harney's troops massacred Little Thunder's band of Brule Sioux at Ash Hollow, Nebraska.

Exacerbating the situation was the discovery of gold in the Pike's Peak area of Colorado in 1858-1859 and in the South Pass region of Wyoming in 1860. Gold finds in the Black Hills of eastern Wyoming and western South and North Dakota a decade later would also add to the problem.

In 1861, the Ft. Wise Treaty brought about the cession of Arapahoe and Cheyenne lands south of the Platte and east of what is now present-day Rawlins. A year later, Ft. Halleck was established at Elk Mountain, about 40 miles east of present-day Rawlins (see Figure 6-24), to protect the Overland Trail and, to a degree, the Oregon Trail, although it was far to the north.

Although the Shoshoni generally remained friendly, Larson (1965/1978:19) notes "Even the Shoshoni magnanimity toward the white was tarnished in 1862 when hostile Shoshoni and Bannock warriors raided the trails of Idaho and Wyoming." In March of that year, a group of Shoshoni attacked the Split Rock Station and later that year they attacked the stage crossing on the Green River. During the early portion of the winter of 1862-1863, a group of Shoshoni and Bannocks (probably the band which would later be called the Ft. Hall Shoshoni) harassed travelers and settlers in southern Idaho (Larson 1965/1978:19; Rogers 1938:67). In January 1863, Col. Connor's volunteers attacked the latter group at the Bear River in Idaho, inflicting heavy casualties on them and ending further hostilities with the Shoshoni. Later in 1863, the first of two Ft. Bridger treaties brought about an agreement that the Shoshoni would stop bothering emigrants passing through their area (as of then the Shoshoni had not yet been assigned a reservation) and the Shoshoni were promised \$10,000 in goods annually for 20 years.

November 1864 brought another black spot on America's somewhat blemished dealings with the Native Americans. Black Kettle's band of Cheyenne, which according to most accounts had caused no problems for the Euro-Americans, was massacred by Col. Chivington's Colorado Volunteers (Third Colorado Cavalry). These killings may have been the single most important factor in the renewal of hostilities as the Cheyenne and the Sioux began again their attacks on the trails east of Muddy Creek and South Pass as a response to the Sand Creek Massacre.

In 1865, a series of campaigns were conducted in the Powder River region. Two battles were waged at the Platte Bridge (formerly known as the Mormon Ferry) in July of that year and Ft. Caspar (see Figure 6-24) was built at that site shortly thereafter. Throughout 1865 and 1866 Col. Connor carried out a series of campaigns north of the Overland/Cherokee Trails designed to pull the Sioux and Cheyenne away from railroad and survey crews building the Union Pacific route across southern Wyoming. Later in that year Ft. Halleck was abandoned. In December 1866, a wood detail and a relief column from Ft. Phil Kearney (see Figure 6-24) came under attack from the Sioux. Both sides suffered heavy casualties. Another attack on a wood detail from Ft. Kearny,

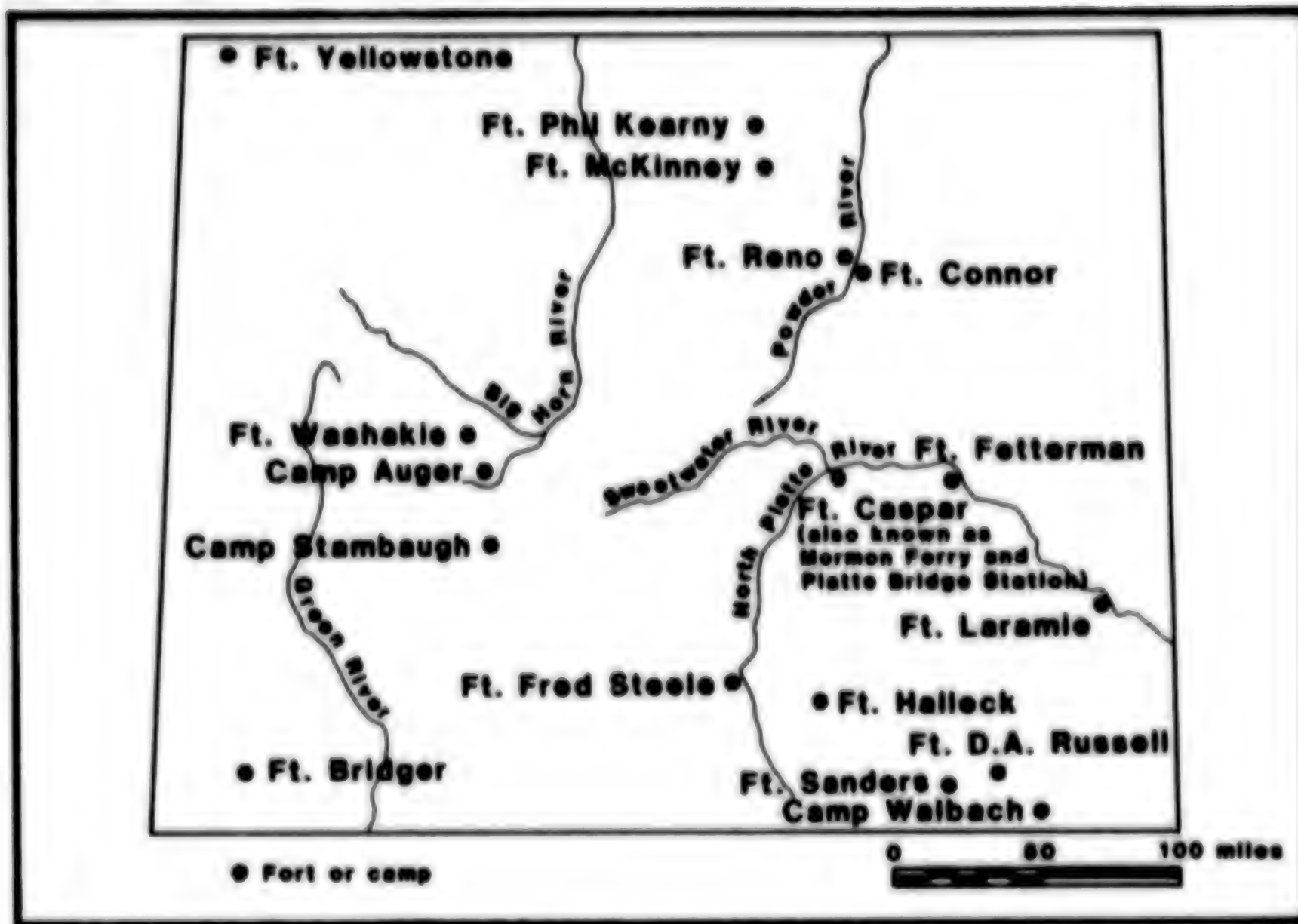


Figure 6-24. Military forts and camps in Wyoming in the late 1800s (after Frazer 1965:179).

the Wagon Box Fight, occurred in August 1867, but with less successful results for the Indians. Also in 1867, Ft. Caspar was abandoned and was promptly burned down by the Indians.

The second Ft. Bridger Treaty was concluded in 1868. This assigned to the Shoshoni a large reservation in the basin east of the Wind River Mountains but allowed them to range throughout southwestern Wyoming on their seasonal rounds. Reher in Siemens and Walker (1977a:84) states that Washakie was recognized as the principal Shoshoni chief and cites Shimkin (1967:247) as describing the territory traditionally used by the Shoshoni:

"All the bands would gather each spring in the Wind River Valley under the general leadership of Washakie. They would then cross the Wind River Mountains by following Trout Creek to Misquito Park, then going to Washakie Pass. From there they would descend the Big Sandy, crossing it near the Lombard Ferry. After this, they would go across Black's Fork to Ft. Bridger. In this neighborhood, more especially near the headwaters of the creeks, they would stay for the summer. Early in the fall, they would return to Wind River, and separate for the buffalo hunt."

Of interest here is that they descended the Big Sandy and crossed "it" at or near the Lombard Ferry. Whether "it" refers to the Big Sandy or the Green River can not be deciphered from the above passage (one would assume it to be the Green River, since it is upon that river that the ferry was located). What is of importance is that the Shoshoni traversed the center of the Seedskadee project area on a yearly basis from at least 1868 and probably much earlier.

Further east, in 1868, the wars continued. Ft. Fred Steele (see Figure 6-24) as established on the North Platte River about 15 miles east of where Rawlins is located today. In November 1868, Col. G.A. Custer attacked Black Kettle's band of Cheyenne at the Battle of the Washita.

From 1869 through 1877, there was continuous but generally insignificant raiding by the Sioux and Cheyenne and retaliations by the U.S. Army. There were a few exceptions to this, however. In 1876, Gen. Crook undertook a series of campaigns in Montana and northern Wyoming, accompanied by 176 Crow and 86 Shoshoni scouts. In June 1876, part of Crook's forces, under the command of the glory-hungry Gen. George Armstrong Custer, engaged a superior force of Sioux and Cheyenne at the Little Big Horn River in Montana and were annihilated. During the period 1877-1881, the Sioux and Cheyenne fought a series of losing battles before illness, starvation, lack of manpower, and weather finally forced them to surrender. In July, 1881, Sitting Bull, who had led his band of Sioux into Canada rather than surrender, brought the remnants of his free-roaming warriors back to the United States to surrender to American authorities. The assistance and reservation he had expected to receive there had not materialized. The Indian wars in the northern Plains had ended.

In spite of the Indian wars, the changes occurring in Wyoming came at a rapid rate. First the fur traders had come. Then, as the demand for fur dropped and as gold finds in California fired the imaginations of some and lush lands in Oregon, Washington, and southern Idaho the hopes of others,

Table 6-3.

Euro-American/Native American Confrontations 1850-1890

1851	Ft. Laramie Treaty in which the United States was to compensate the Plains tribes for damages done to their lands by the emigrants. The Indians were to stop inter-tribal warfare and recognize boundaries for various tribes and nations while allowing the United States to establish roads and forts in their territory
June 1853	3 Miniconjou Sioux killed when whites try to arrest another member of their village
August 1854	Mormon cow killed by a visitor to a Brule Sioux camp. Lt. Gratton and his 29 member patrol are killed while trying to arrest the visitor
1855	Little Thunder's band of Brule Sioux massacred by Gen. Harney at Ash Hollow, Nebraska, in retaliation for the killings of Lt. Gratton and his men
1858-1859	Gold discovered near Pike's Peak in Colorado
1860	Gold discovered near South Pass in Wyoming
1861	Ft. Wise Treaty brought cession of Arapahoe and Cheyenne lands south of the Platte and east of today's Rawlins
March 1862	Shoshoni attack Split Rock Station
1862	Shoshoni attack stage crossing on the Green River
winter 1862	Shoshoni and Bannocks attack settlers and travelers in southern Idaho
1862	Ft. Halleck established at Elk Mountain to protect the Overland Trail and, to a degree, the Oregon Trail
January 1863	Col. Connor attacks Shoshoni and Bannocks at Bear River, Idaho, ending further hostilities with the Shoshoni
1863	First Ft. Bridger Treaty in which the Shoshoni promised to stop bothering the whites passing through their area and in which they were promised \$10,000 in goods annually for 20 years
November 1864	Black Kettle's band of Cheyenne massacred by Col. Chivington's Colorado Volunteers (Third Colorado Cavalry)

Table 6-3 (cont.).

1864	Cheyenne and Sioux renew their attacks on the trails east of Muddy Creek and South Pass in response to the Sand Creek Massacre
1865	Powder River campaign
July 1865	Two battles fought at Platte Bridge
1865	Ft. Caspar built (at the Platte Bridge Station)
1865-1866	Connor conducts a series of campaigns designed to pull the Cheyenne and Sioux away from railroad construction and survey crews
1866	Ft. Halleck abandoned
December 1866	Wood detail and relief column from Ft. Kearny attacked by Sioux with high casualties on both sides
1867	Ft. Caspar abandoned and promptly burned down by the Indians
August 1867	Wagon Box Fight--the Sioux attacked another wood detail from Ft. Kearny, with less successful results
1868	Second Ft. Bridger Treaty which assigned to the Shoshoni a large reservation east of the Wind River Mountains
1868	Ft. Fred Steele established on the North Platte River about 15 miles east of Rawlins
November 1868	Col. G.A. Custer attacks Black Kettle's band of Cheyenne at the Battle of the Washita
1868-1877	continuous but generally insignificant raiding by the Sioux and Cheyenne
1876	Gen. Crook campaigns with Indian allies: 176 Crow and 86 Shoshoni
June 1876	Gen. Custer and his Seventh Cavalry engage a superior force of Sioux and Cheyennes and are annihilated
1877-1881	Sioux and Cheyenne fight a series of losing battles before illness, starvation, weather, and lack of fighting men for their surrender
July 1881	Sitting Bull and the last of the free-roaming warriors, leads the remnants of his band back from Canada to surrender to the United States authorities

the trading posts became oases for the waves of emigrants passing through. Still later, these became change-overs for the Pony Express riders and rest stops for the stage coach lines. These two modes of transport were quickly supplanted by the advent of the telegraph and the "iron horse", the Union Pacific and the Central Pacific Railroads. The arrival of the railroad made both the sheep and the cattle industries very profitable and also brought more people, especially homesteaders, to Wyoming. As the technologies of the United States grew, the demands for minerals and energy sources also grew. With submission of the Native American groups, nothing stood in the way of the expansion and development of all the resources and potential of Wyoming, especially in the Seedskadee region.

ARCHIVAL SEARCH FOR SITES FOUND IN THE SEEDSKADEE REGIONAL STUDY AREA

Several definitions are required for the discussion of the archival search for sites relevant to the Seedskadee Project. First, the term Regional Study Area (RSA) refers to the area around and including the Fontenelle Reservoir in southwestern Wyoming and the Bureau of Reclamation's lands along the Green River, both north and south of the reservoir. This area was delineated for the purposes of the project as lying between 41 degrees, 35 minutes and 42 degrees, 12 minutes, north latitude and 109 degrees, 25 minutes to 110 degrees, 13 minutes, west longitude. The term Project Study Area (PSA) refers to the Bureau of Reclamation lands only as described in Section 6 of the Interagency Agreement (2-07-40-53351) between the Bureau of Reclamation and the National Park Service, dated 17 September 1982.

In January 1983, several members of the Branch of Remote Sensing, National Park Service traveled to the Wyoming State Historic Preservation Office at the Department of Anthropology at the University of Wyoming in Laramie to examine the pertinent sites reports and copy the site files of those sites found to be in the Regional Study Area. They returned to Albuquerque with in excess of 840 site files and more were subsequently sent by the SHPO's office, bringing the total of sites to 856. The data in those files were coded into a computer format, which borrowed heavily from IMACS (Inter-mountain Antiquities Computer System). Fifty-five variables were coded.

A number of problems arose in trying to code all 856 sites. Basically, only 19 survey contractors provided all the 856 site records. The site files had usually been prepared by the survey organization responsible for the survey. Because of this, the availability of certain data varied considerably. Also, the time span, basically 1976 to 1982, contributed to the variation in quality and quantity of the site reporting. The availability of data may be seen in Table 6-4. An explanation of the variables and a few comments on some is presented here.

Locational Information:

All the surveyors provided the legal descriptions. The depth of this information ranged from township, range, and section to township, range, and 1/4 of 1/4 of 1/4 of 1/4 of a section. All site records but three had this variable. UTM's (Universal Transverse Mercator grid system) are only used by three surveyors all the time and by one occasionally and, often, the UTM is at great variance with the legal description. Other means, such as longitude and latitude or distance from the N/S/E/W section lines were given occasionally by three surveyors. The map name and type,

usually USGS 7.5' or 15', were always provided by 13 groups and occasionally by 2 others. A verbal description of site access was always provided by seven contractors and sometimes by an additional five. The name of the owner of the land upon which the site was located was always given by eight surveyors and often by another four.

Landform Information:

Only three contractors provided the geographic region's name consistently while five others did so intermittently. This was not critical for this project since it is all Green River Basin. The areal topography or general landforms of the area was provided by five groups all the time and by four others much of the time. The site specific landform was included by six groups while an additional four gave it sometimes. Only four survey institutions gave the adjacent landforms with another four providing it occasionally. The reports of thirteen surveyors always included a verbal description of the landforms and often had comments on the vegetation as well. Two others often gave that information also.

Situation:

Ten groups usually said what the aspect or what direction the site faced and three others often did. The degree of slope on the site was always given by seven contractors and often by four more. Surprisingly, the site elevation was only provided consistently by 11 survey organizations and often by 2 others. No group reported comments on the visibility from the site regularly but three often did.

Vegetation:

This variable was one of the more often found types of information in the reports, 12 organizations always giving it and 3 other doing so often.

Hydrology:

Only six surveyors were always concerned with the distance to a major areal water source while three others sometimes gave this data. The distance to the nearest water source, intermittent or permanent, was always reported by nine groups and sometimes by another three. Seven always gave the distance to the nearest permanent water source and three others often did.

Soils:

Eight survey groups consistently informed readers about the soils around the site and an additional four sometimes gave that information.

Management Information:

Only four contractors commented on the current land use of the sites found all the time, but six others often did. Eleven groups did comment on past disturbance or impacts to every site with four other groups often doing so. Future impacts, primarily those that would be caused by man, were always considered by nine surveyors and one did so occasionally. Ten survey institutions rated every site they found as to its significance and potential to be nominated to the National Register of Historic Places and two others sometimes did so. Only six groups, however, consistently evaluated every site's research potential with an additional three doing it occasionally. Nine contractors always made recommendations about the necessity of further work and four more often did. Only four surveyors always made comments on bibliographic references but two others often did.

Site Information:

Only five contractors always stated whether collections had been made while five others sometimes did. Of those, only two consistently stated their collection methodology, if collections were made, while three others often did. Only four groups always provided site maps, although six others usually did. Only four surveyors always provided other maps, such as xeroxes of USGS 7.5' quadrangles, to show the site locations with eight more often doing it. Twelve organizations always stated the type of site found and its size while three others often did it. Only seven consistently considered the depth and nature of deposits on the site with another two often recording this information. Ten groups always tried to give the age or temporal placement of each site with an additional four often doing so. Artifact descriptions were always provided by 17 survey institutions and one sometimes did so. Feature descriptions were consistently given by six groups and three others did so fairly often. Only one group always stated whether the site had been tested or not and only two did so on an intermittent basis. Additional comments about the site were consistently made by 11 surveyors but 2 others often did so also.

With institution of a standardized set of site recording forms by the Wyoming State Historic Preservation Office and the Office of the Wyoming State Archeologist in the 1970s, vast improvements were seen in the comparability of data, and, with the initiation of the use of IMACS in Wyoming, the quality of the site recording data should continue to improve.

With the data provided by those 856 site records it was possible to learn that the vast majority (716) were temporally/culturally unidentifiable prehistoric sites. However, 140 sites were identifiable--84 Historic and 56 prehistoric. Over 180 components were represented in those 140 sites (see Table 6-5). The components could be broken down into 10 time periods: Paleo-Indian, general Archaic, Early Archaic, Middle Archaic, Late Archaic, Late Prehistoric, Proto-historic, Unknown Prehistoric, Historic, and Unknown Historic.

The Historic sites which could be dated provide some interesting parallels with the history of Wyoming as a whole. Each site and each component within each site was treated as a separate site for each decade during which it was occupied. This information was then plotted on a graph. As can be seen in Figure 6-25, the earliest sites occur in the 1840s and increase in number until the 1860s. There is a decrease in the number of sites during the 1870s, possibly as a result of the Euro-American/Native American hostilities. The numbers of sites increase sharply in the 1880s, continue rising sharply in the 1890s, and peak in the period 1900-1909. The number of sites drops gradually in the period from 1910-1919, and much quicker from 1920-1929, probably the result of the droughts of the late 1910s and a minor depression at the end of that decade. The fewest sites dating to a decade since the 1870s occurs in the 1930s, during the Great Depression. There is a small upswing in the 1940s, a trend which continues through the 1950s, and then tails off through the 1960s and into the 1970s, at which point the number of sites levels off. The upswing of the 1940s probably reflects the mineral development after World War II and the continued rise to the booming economy in the late 1940s and early 1950s. It is extremely interesting to see how closely the data from the archeological record reflects what is known about the area historically, considering only 4.26 percent of the ground surface there has been surveyed.

Table 6-4.

Reporting Variables used by Survey Institutions
in the Seedskadee Regional Study Area

	Always Used	Sometimes Used	Never Used	# of sites with data	# of sites without data
Legal Description	19	0	0	853	3
UTM's	3	1	15	461	395
Other Location System	0	3	16	---	---
Map Name and Type	13	2	4	802	54
Site Access Description	7	5	7	781	75
Name of Site Owner	8	4	7	571	285
Geographic Region	3	5	11	---	---
Areal Topography	5	4	10	146	710
Site Specific Landform	6	4	9	206	650
Adjacent Landforms	4	4	11	133	723
Verbal Descriptions	13	2	4	828	28
Aspect	10	3	6	775	81
Slope	7	4	8	269	587
Elevation	11	2	6	621	235
Visibility	0	3	16	412	444
Vegetation	12	3	4	791	65
Major Areal Water Source	6	3	10	552	304
Nearest Water Source	9	3	7	612	244
Nearest Permanent Water	7	3	9	263	583
Soils	8	4	7	615	241
Current Land Use	4	6	9	185	671
Disturbance/Impacts	11	4	4	802	54
Future Impacts	9	1	9	728	128
NRHP Status	10	2	7	766	90
Research Potential	6	3	10	311	545
Recommendations	9	4	6	787	69
Bibliographic References	4	2	13	46	810
Collections Performed?	5	5	9	533	323
Collection Methodology	2	3	14	127	729
Site Maps	4	6	9	670	186
Other Maps	4	8	7	800	56
Site Type	12	3	4	788	68
Site Size	12	3	4	841	15
Deposit Depth & Nature	7	2	10	648	208
Site Age/Temporal Placement	10	4	5	344	512
Artifact Descriptions	17	1	1	848	8
Feature Descriptions	6	3	10	695	161
Testing Done?	1	2	16	50	806
Additional Comments	11	2	6	700	86

Table 6-5.

Site Type Summaries for the Seedskadee Regional Study Area

Historic Sites	Identifiable Prehistoric Sites	Total Identifiable Sites	Total Components	Unidentifiable Prehistoric Sites	Total Sites Records
84	56	140	182	716	856

Components:

Paleo-Indian:	5
General Archaic:	8
Early Archaic:	2
Middle Archaic:	15
Late Archaic:	16
Late Prehistoric:	22
Proto-Historic:	3
Unknown Prehistoric:	23
Historic:	40
Historic Unknown:	<u>48</u>
Total Components	182

Historic Sites Dating:

1841-1861	1 site	1890-1914	1 site
1842-1849	1 site	1890-1920	1 site
1848-1858	1 site	1890-1925	3 sites
1849-1900	1 site	1890-1980	1 site
1850-1980	1 site	1900-1920	2 sites
1856-1868	1 site	1900-1925	1 site
1860-1870	1 site	1900-1982	1 site
1864-1892	1 site	1900-unk.	2 sites
1869-1876	1 site	1920-1940	1 site
1880-1920	7 sites	1930-1980	1 site
1880-1925	2 sites	1930-unk.	2 sites
1880-1950	1 site	1940-1970	1 site
1889-1910	1 site	1950-1960	<u>2 sites</u>
1890-1910	1 site	Total	40 sites

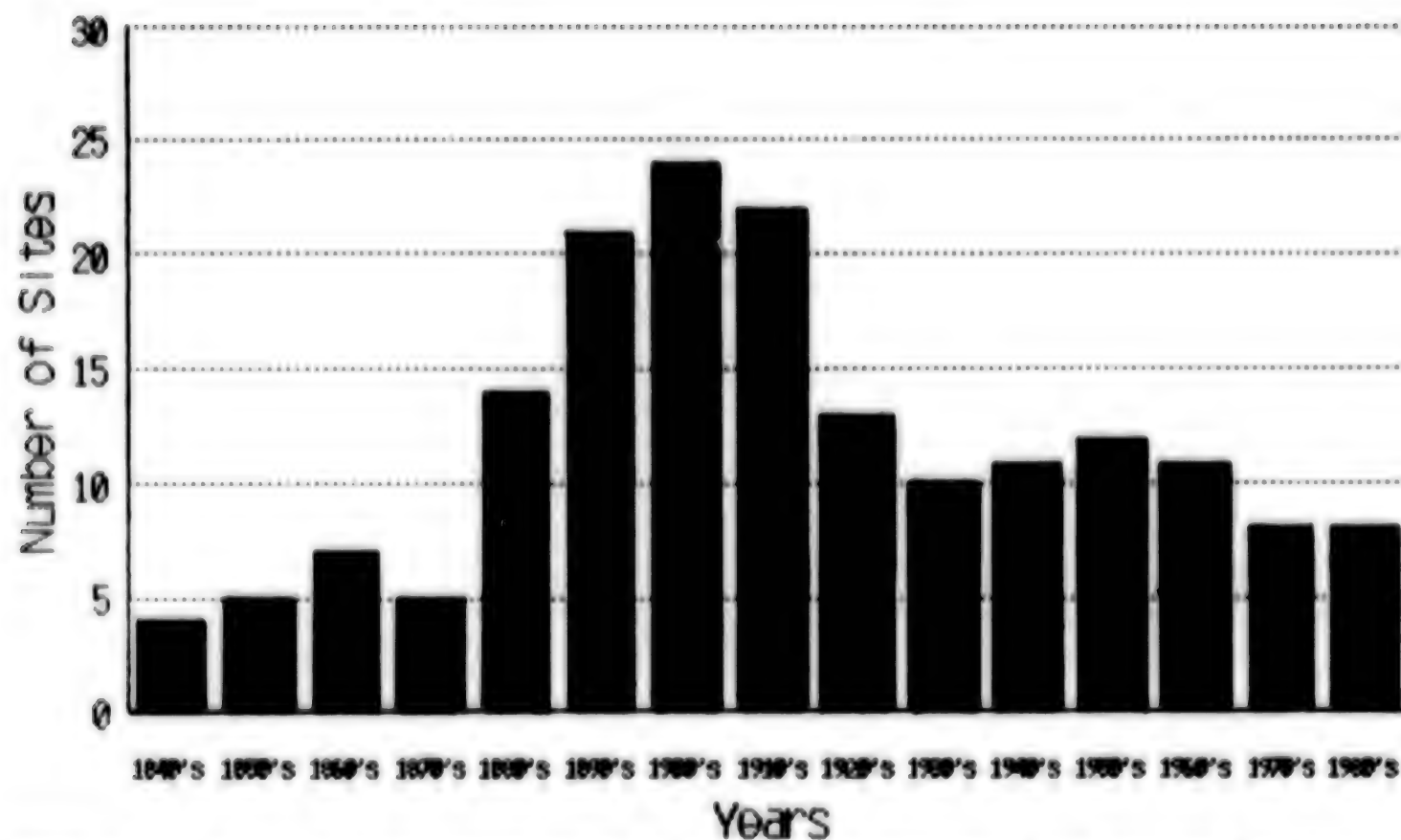


Figure 6-25. Historic Site Occupations in the Seedskadee Regional Study Area by Decades.

As Drager (see "National Register Sites...", this volume) has noted, there are three sites within the project study area which have been nominated to or are already on the National Register of Historic Places. In addition to those three sites, there are 21 other sites in the regional study area which are on the Register or have been nominated to or recommended by the surveyor for nomination to the Register (see Figure 6-26). Seven, including the three discussed by Drager, are Historic and all represent activities associated with emigration or transportation. 48LN345 (Names Hill), 48SW1814 (Big Sandy Stage Station), and 48SW1848 (Hornon/Lombard Ferry) are the sites reported upon by Drager. Sections of the Overland Trail are represented by 48SW1226. Artifacts found at 48SW1226 indicate three periods of utilization of the area from 1849 to 1922. The Old South Bend or Granger Stage Station was designated 48SW939. There were apparently two separate occupational periods here, 1856-1868 and 1868-unknown ending date. The Alkali Creek Stage Station, later called Shaul Ranch, was numbered 48SW3032. Artifacts here also indicate two occupations 1869-1876 and one which was not dated. The final site, 48SW1818 or Simpson's Hollow, cannot be discussed, since the site records did not indicate what it was or occupational dates.

Sixteen prehistoric sites and one proto-historic site were also recommended for nomination to or were nominated to the Register. A number were lithic scatters with no temporally or culturally diagnostic materials: 48LN523, a 300 by 300 meter scatter with two possible hearths; 48LN760, a 200 by 200 m scatter with a number of hearths and some possible structures; 48LN824, a 49 hectare scatter with three hearths; 48SW1943, a 100 by 480 meter scatter, with four concentrations of fire-cracked rock; 48SW2491, a 90 by 100 meter scatter of hundreds of flakes and four projectile points, none of which were identified; 48SW2636, a large scatter with more than 25 scatters of fire-cracked rock, possibly 6-9 hearths, and a groundstone scatter; 48SW3269, a 60 by 100 meter scatter with fire-cracked rock scatters; 48SW3607, a 30 by 40 meter scatter; and 48SW3608, a 125 by 170 meter scatter with several possible features. One Early Archaic site, 48LN507, was represented by a 420 by 830 meter lithic scatter with five unidentified projectile points. One Middle Archaic site, 48SW2028, consisted of a 105 by 390 meter scatter of lithics, 13 activity areas, and 2-3 hearths. Two sites were called either Middle or Late Archaic: 48LN919, a 375 by 400 meter scatter of lithics containing an estimated 10,000 artifacts, several possible hearths, 2 McKean projectile points, and an unidentified Late Archaic point reworked into a drill and 48LN710/48SW3371. The latter site is a 600 by 750 meter lithic scatter which straddles the Lincoln/Sweetwater County line and consists of 5 concentrations of fire-cracked rock and over 5,000 artifacts. One Late Archaic site was reported: 48SW3246, a 60 by 300 meter scatter with four hearths. A Late Prehistoric site, 48SW5182--a 60 by 130 meter lithic scatter with a tri-notched projectile point, a side-notched point, and a hearth, has the potential for nomination to the Register. One possibly Fremont site, 48SW3370, was recommended for nomination. This was a 210 by 390 meter scatter of over 2,000 lithics and at least one Uinta Gray Ware sherd. One proto-historic site was also recommended for nomination. It was a 45 by 85 meter scatter of lithics and groundstone with two hearths and a historic (metal?) lancehead or knife dating to the middle 1800s.

The 1983 Seedskadee Project Survey conducted by Chambers Consultants and Planners for the National Park Service (see Wandinider & Larralde, "Seedskadee Cultural Resources Assessment Project...", this volume) examined 25 randomly selected 500 by 500 meter blocks within the project study area for

100 percent sample survey. This innovative survey did not record sites per se, but individual artifacts within the 500 by 500 m block. According to Wendenider and Larralde, the number of artifacts per block ranged from 0 to 1,700. Smithsonian site numbers were assigned to each block and 23 of the 25 blocks surveyed have also been nominated to the National Register of Historic Places: 48LN1297, 48LN1298/48SW5840, 48SW5820-48SW5839, 48SW5841, 48SW5388, and 48SW5696.

THE 1983 SEEDSKADEE PROJECT SURVEY

While between 10,000 and 11,000 artifacts were recorded in the field during the 1983 Seedskadee project survey, only 83 could be considered diagnostic lithic artifacts. Those consisted of 2 knives and 81 projectile points. All were drawn and a number of them were collected and brought back to Albuquerque, pending a decision on which curatorial institution would receive them. A comparison of the drawings and/or the actual artifacts with the drawings in Appendix XIII permitted Branch of Remote Sensing personnel to confirm projectile point identifications made in the field and, in a number of cases, allowed some previously unidentified points to be typed. These diagnostic artifacts were found in 19 of the 25 survey blocks and four other diagnostics were noted outside of the survey areas. Table 6-6 presents a general breakdown as to the time periods these artifacts represented.

The Paleo-Indian period was represented by 48SW5823--a bevelled knife; 48SW5828--2 probable Plainview points; 48SW5829--a reworked point, either an Eden or a Terminal Paleo-Indian Lanceolate II; 48SW5833--a probable Plainview; 48SW5841--a Folsom preform, a Plainview, a Terminal Paleo-Indian Lanceolate II, a Cody Knife, and an Eden point; 48SW5388--a Terminal Paleo-Indian Lanceolate I point; and a possible Agate Basin or Eden found outside the sample units. The Early Plains Archaic occurred in two blocks: 48SW5820--a corner-notched point and 48SW5826--two corner-notched points. The Middle Plains Archaic was well represented: 48SW5822--a probable Yankee point; 48SW5826--either an Elko Eared or a Duncan; 48SW5828--a McKean Lanceolate; 48SW5841--six Mallory Side-notched points; 48SW5696--another McKean Lanceolate; and yet another McKean Lanceolate outside the survey blocks. The Late Plains Archaic was the best represented of all the periods, although some of the points here called Late Archaic could just as easily have been called Late Prehistoric in another report. These points were found in: 48SW5820--two corner-notched; 48SW5821--a corner-notched; 48SW5822--two corner-notched; 48SW5824--a corner-notched; 48SW5825--a corner-notched; 48SW5826--six corner-notched; 48SW5828--three corner-notched; 48SW5832--a corner-notched; 48SW5834--corner-notched; 48SW5835--a corner-notched; 48SW5836--two corner-notched; 48SW5839--a corner-notched; 48SW5841--four corner-notched; 48SW5388--a corner-notched; and 48SW5696--a corner-notched and a side-notched. The Late Prehistoric was also well represented: 48SW5820--a corner-notched; 48SW5822--two corner-notched and a triangular point which may have been a Cottonwood Triangular; 48SW5823--a triangular point, possibly a Cottonwood; 48SW5825--a possible Prairie Side-notched; 48SW5826--five corner-notched, one of which, with its serrated edges, had similarities with the Wallula Rectangular-stemmed, North Fork variety; 48SW5828--a Plains Side-notched (probably Washita Triangular or its Desert Side-notched equivalent) and two corner-notched, one of which showed a resemblance to the Rose Spring Corner-notched or the Eastgate Expanding-stem; 48SW5834--two corner-notched and a triangular point; 48SW5841--a probable Eastgate Split-stem, two Plains

Table 6-6.

Diagnostic Lithic Artifacts Found during the 1983 Seedskadee Project Survey

Survey Block	Paleo-Indian	Early Plains Archaic	Middle Plains Archaic	Late Plains Archaic	Late Prehistoric	Unidentified	Total
48LN1297						1	1
48BW5820		1		2	1		4
48BW5821				1			1
48BW5822			1	2	2		5
48BW5823	1				1		2
48BW5824				1		1	2
48BW5825				1	1	1	3
48BW5826		2	1	6	5		14
48BW5828	2		1	3	3		9
48BW5829	1						1
48BW5832				1			1
48BW5833	1						1
48BW5834				1	3		4
48BW5835				1			1
48BW5836				2			2
48BW5839				1			1
48BW5841	5		6	4	5		20
48BW5388	1			1	1		3
48BW5696			1	2	1		4
outside the survey	<u>1</u>		<u>1</u>		<u>2</u>		<u>4</u>
Total	12	3	11	29	25	3	83

Side-notched (probably Buffalo Gap Single-apur variety or its Desert Side-notched counterpart), and two corner-notched; 48SW5388--an Avonlea point; 48SW5696--a Plaine (Emigrant Basal-notched variety) or a Desert (Sierra variety) Side-notched; and two corner-notched points found outside the sample areas.

SUMMARY STATEMENT

As was noted in the introduction to this chapter, the Seedskadee Project area lies at the interface of two, and possibly three, physiographic zones and cultural sequences. It was stated that the intent of this section was to examine each of those zones and sequences to get a better idea of what may have been happening in the Seedskadee region prehistorically. The tack taken here was to examine each sequence independently, to learn what projectile point types existed there and when, and to give a description of each type and variety, according to the literature. While this method may be criticized as old-fashioned and a return to "trait-list archeology", this was not the intent. Rather, this was an attempt to provide other archeologists working in southwestern Wyoming with a workable guide. As is reported in the introduction to Appendix XIII, it became obvious very quickly, when reviewing the site records provided by the Wyoming State Historic Preservation Office, that archeologists working in the Seedskadee Regional Study Area often were not identifying projectile points found on sites found by them. Whether this reluctance to make identifications was occurring because of a lack of confidence in identifying the points correctly or whether it was felt that knowing the point types, and, by extension, their dates, has no relevance to what was occurring at the sites being found is not clear. If it is, or was, the former, then this report and Appendix XIII will serve their intended purposes. If the latter, the question "why?" must be asked.

In the discussion of the cultural sequences and their projectile point types, comparisons were made between types found in more than one area which have basic similarities in morphology but different names. During the literature search, sites having a particular projectile point type were noted and have been reported here. Also dates for a given point type at a particular site were given as often as possible, although dates given by various authors for the same sites often differed.

The Historic period for Wyoming was reviewed, not only from the perspective of what the Euro-Americans were doing there, but also with regard to what was happening to the Native Americans there.

A very brief review was made of the list of sites in the regional study area which are already on the National Register of Historic Places or have been nominated to or recommended for nomination to the Register. To this list were also added the sites or sample blocks of the 1983 Seedskadee Project survey which were recommended for nomination to the Register.

Finally, an extremely short presentation of the temporally/culturally diagnostic lithic artifacts discovered during the 1983 Seedskadee Project survey was given.

NATIONAL REGISTER SITES FOUND ON THE SEEDSKADEE NATIONAL WILDLIFE REFUGE, WYOMING

by

Dwight L. Drager

On the land owned by the Bureau of Reclamation within the Seedskadee Cultural Resources Assessment Project area, there are currently three archeological sites listed on the National Register of Historic Places. The three sites are all from the historic period and are examples of the various uses the project area was put to during historic times.

One of the sites is currently a Wyoming State Historical Monument known as Names Hill. The site is listed as 48LN345 and was reported by Day and Dibble in 1962. It consists of the names of immigrants who were travelling the Oregon Trail carved into a soft, riverbank bluff above the Green River.

A second, but somewhat related, site is the one listed as 48SW1848 and known as the Lombard Ferry. This area was first used as a ferry by mountain men from 1842 to 1848. It then became known as the Mormon Ferry until 1858. From 1889 until the early 1900's, a ferry was operated at this location by William Lombard who gave his name to the current location after he homesteaded the land. Currently, no features or artifacts remain on the site except for the swales worn into the land as a result of the many wagons which passed through this area.

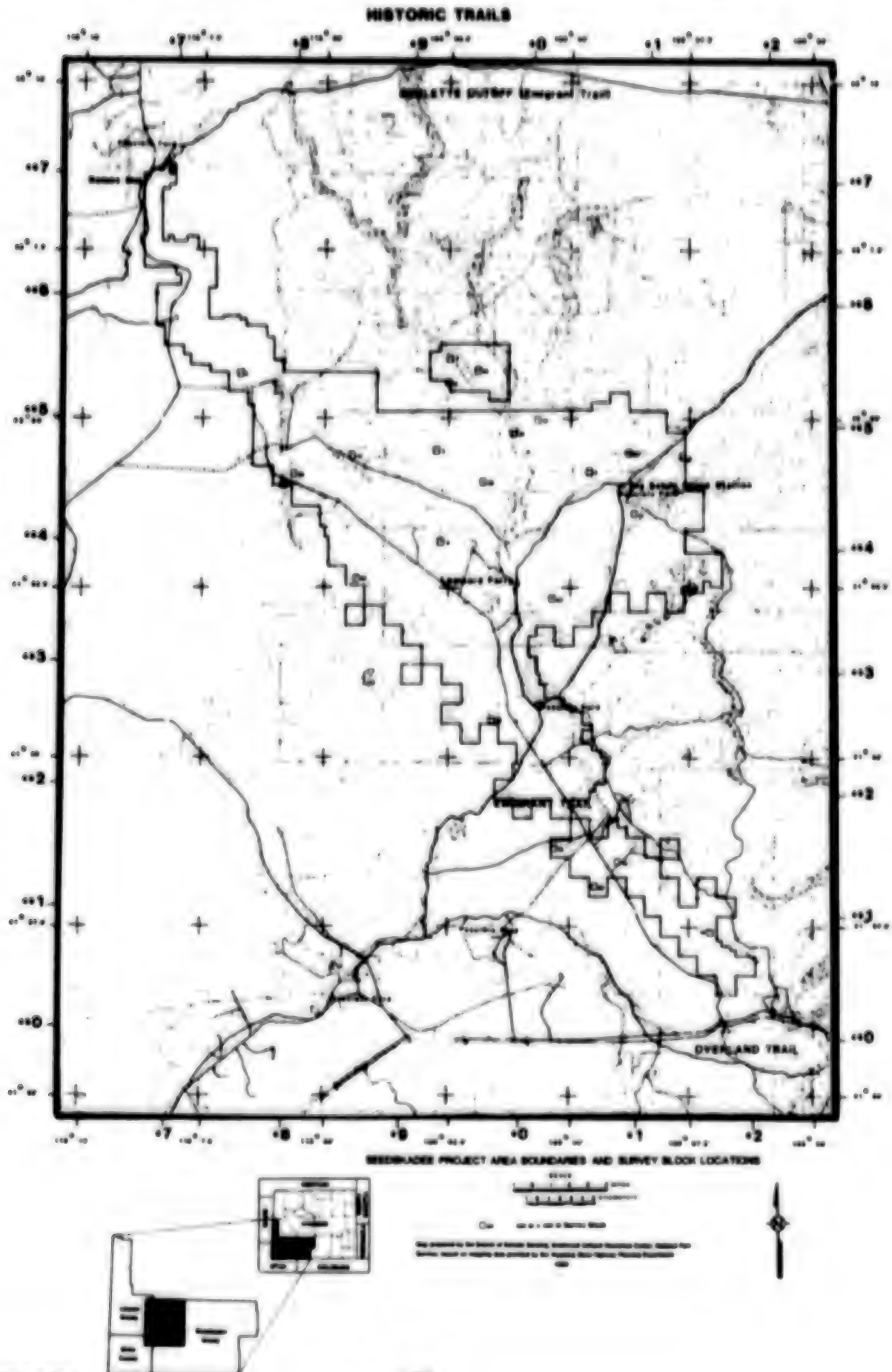
The final National Register site in the project area is known as 48SW1814, the Big Sandy Stage Station. Little is known of it except that it was apparently a Pony Express stage station along the Ft. Bridger Route. Even its location is rather nebulous.

Attached are the complete materials available from the Wyoming State Historic Preservation Office archives at the Department of Anthropology of the University of Wyoming in Laramie, Wyoming. Also included is a map (Fig. 7-1) indicating the location of each of the National Register sites.

The primary historical use of the project area seems to have been as a transportation route. The Overland and Emigrant Trails and their associated cut-offs passed through or near the project area and have been well mapped by the US Geological Survey from aerial photographs on their 7.5-minute series maps. An overlay (Fig. 7-1) to the project base map of the trails has been constructed of all the mapped segments and is included with this report.

Figure 7-1

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



482.47345
39

ARCHAEOLOGICAL SITE REPORT FORM

Send To: Wyoming Archaeological Survey
Department of Anthropology
University of Wyoming
Laramie, Wyoming 82071
Telephone Number 766-5136

Crabtree
Soc. U.S.
Geo. Tgt
Soc. A

Name: Day & Dibble Telephone: _____
Address: _____

Site Location: (provide as much detail as possible): UTM 12: 967140E 4669780N

Township: T5N, Range: R12W, Section: 5

County: Lincoln

Other: 6 mi S of LaBarge on U.S. 189.
Northern extreme maximum of foot level



Site Description:

Names Hill.

Dragon Trail immigrants signatures inscribed onto
river bank bluff.

Artifacts found and where they are stored:

Landowner:

Name: Julius E. Lucia Telephone No. _____
Address: _____

Miscellaneous Information and Recommendations

(Include maps, photos, drawings, or other information if possible): Use back of sheet.

Day & Dibble

1962 Anthropological Papers No. 58. University of Utah.

Listed as F48H68 in Day & Dibble

NATIONAL REGISTER OF HISTORIC PLACES
INVENTORY - NOMINATION FORM

(Type all entries - complete applicable sections)

STATE:
Wyoming

COUNTY:
Lincoln

FOR NPS USE ONLY

ENTRY NUMBER	DATE

1. NAME

COMMON:
Names Hill

AND/OR HISTORIC:

2. LOCATION

STREET AND NUMBER:
NW $\frac{1}{4}$ and SW $\frac{1}{4}$, Section 5, T. 25 N. R. 112 of 6th P.M.

CITY OR TOWN:

STATE: Wyoming CODE: 49 COUNTY: Lincoln CODE: 023

3. CLASSIFICATION

CATEGORY (Check One)	OWNERSHIP	STATUS	ACCESSIBLE TO THE PUBLIC
District ☐ Building ☐	Public ☒	Occupied ☐	Yes: ☐
Site ☒ Structure ☐	Private ☐	In Process ☐	Unoccupied ☒
Object ☐	Both ☐	Being Considered ☐	Preservation work in progress ☐
			Unrestricted ☒
			No: ☐

PRESENT USE (Check One or More as Appropriate)

Agricultural ☐	Government ☐	Park ☐	Transportation ☐	Comments ☐
Commercial ☐	Industrial ☐	Private Residence ☐	Other (Specify) ☒	
Educational ☒	Military ☐	Religious ☐	State Historic	
Entertainment ☐	Museum ☐	Scientific ☐	Site	

4. OWNER OF PROPERTY

OWNER'S NAME:
State of Wyoming, administered by the Wyoming Recreation Commission

STREET AND NUMBER:
604 East 25th Street

CITY OR TOWN: Cheyenne STATE: Wyoming CODE: 49

5. LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.:
Wyoming Recreation Commission

STREET AND NUMBER:
604 East 25th Street

CITY OR TOWN: Cheyenne STATE: Wyoming CODE: 49

APPROXIMATE ACREAGE OF NOMINATED PROPERTY: 4.25 acres

6. REPRESENTATION IN EXISTING SURVEYS

TITLE OF SURVEY:
Wyoming Recreation Commission Survey of Historic Sites, Markers and Mon.

DATE OF SURVEY: Summer-Fall 1967 Federal ☐ State ☒ County ☐ Local ☐

DEPOSITORY FOR SURVEY RECORDS:
Wyoming Recreation Commission

STREET AND NUMBER:
604 East 25th Street

CITY OR TOWN: Cheyenne STATE: Wyoming CODE: 49

FOR NPS USE ONLY
ENTRY NUMBER
DATE

SEE INSTRUCTIONS

WYOMING INVENTORY FORM

Box 3
V1
See Gak
Cover T2

Original

FOR OFFICIAL USE ONLY:

Revised/Corrected

2. State Accession Number

DATE

111111

3. Site Class: 111

Code (1) Historic

Code (2) Prehistoric

Code (3) Historic/Prehistoric

4. Site Number: State: 48/S/W/118/418/ Federal: Other: Lombard Ferry FFR-4
5. Site Name Lombard Ferry 6. Date Recorded 15 September 1982
7. Project Identification Farnon - Fontenelle Road WHD WY 78-82
8. Reported By B. Hickman 9. Company/Institution 10/4 OWSA

LOCATION:

10. County Sweetwater

11. T 122 IN R 1109.10 W Sec. 117 S/W S/W N/W N/W S/W
T R R R R R Sec. 117 S/W S/W N/W N/W S/W
T R R R R R Sec. 117 S/W S/W N/W S/W S/W
T R R R R R Sec. 117 S/W S/W N/E S/W S/W

✓ If more than 4 legal descriptions are used, check block and enter in number 17 below. 18 OE SE NE SE

12. UTM: Zone 112 E 5992710 N 463711410 Ref. Pt. Center
Zone E N Ref. Pt.
Zone E N Ref. Pt.
Zone E N Ref. Pt.

13. Number and Street City

14. USGS Quad Name Thoman School 7.5'15. Other Map Reference

16. Access to Site:

17. NOTES: Turn east off of Highway 372 at Painter's Store junction on to Coun. Road B. Drive approximately 14 3/4 miles on County B turning sou on to a two-track just before Eighteen mile Draw. Drive 2 1/2 miles to edge of RS

18. SITE OWNER: Code (1) Federal Agency USFWS District Denver Region VI Seedskad
141 Code (2) State/Local Agency District
Code (3) Indian Reservation
east bank Code (4) Private (Name & Address) Rock Springs Grazing Association
Code (5) Other

19. LANDFORM:

- A) Geographic Region 1018 Name(s) Upper Green River Basin
B) Areal Topography 1011 Name Flat Plains
C) Predominant Site Specific Landform 1218 river bend, river terrace
D) Other Adjacent Landforms 1018 1211 floodplain, terrace
E) Description: Site of the ferry was located on the Emigrant Trail in bend of the Green River. A holding area for those on the east bank waiting to cross was present along the trail on the floor plain.

ATION:

Aspect 10/9 open

B) Slope 1/ 0-4°

C) Elevation 0/6/2/6/5

21. AREAL VEGETATION: 10/4/2 1/1/1 Green River Basin

22. HYDROLOGY:

A) Major Areal Water Source (Name and Type) Green River 4

B) Water Nearest Site - Type A/ Green River Class 1/ permanent

Distance 1/ 0-100 meters Direction 12/ on site

C) Nearest Permanent Water - Same as above 1/

Class 1/

Distance 1/

Direction 1/

23. SOILS: 4/ Describe: Dark tan to brown silt. Depth of soil horizon is undetermined; probably there is up to 1 meter of siltation over cultural lev

24. CURRENT LAND USE: 10/6/ Describe: rangeland / grazing
wildlife habitat

25. SITE INTEGRITY: Code (1) Excellent Code (3) Fair Code (5) None
12/ Code (2) Good Code (4) Poor Code (6) Unknown

A) Describe Impacts (Type-Degree-Cause): Flooding, channel cutting, stock raising,
and probable artifact collecting account for the lack of surface features or
B) Any Anticipated Future Impacts?: artifacts

Farson-Fontenelle Road r-o-w

26. A) National Register Status: Code (1) Not Eligible Code (4) Eligible State
Recorder's Evaluation 12/ Code (2) Eligible National Code (5) Eligible Local
Code (3) Eligible Regional

B) National Register Status: Code (1) Determined Eligible (Date _____)
For Official Use Only Code (2) Determined Ineligible (Date _____)
1/ Code (3) Undetermined (Date _____)
Code (4) Listed on Register (Date _____)
Code (5) Nominated to Register (Date _____)

27. Significance Other Than NRHP: Code (1) Historic Landmark
For Official Use Only Code (2) Natural Landmark
1/ Code (3) State Significance
Code (4) City/County Significance
Code (5) Other
Code (6) Ethnic/Cultural Group
Code (7) Management
Code (8) Research
Code (9) Scientific Use _____ Current _____ Future

Discussion:

A) Recorder's Recommendations for Future Work

- 1546 Code (1) No Further Work
Code (2) Nominate/Determine Eligibility
Code (3) Protect/Preserve/Stabilize
Code (4) Avoid Impact
Code (5) Collect Data: ☐ Photos
☐ Map and/or Drawings
☐ Monitor ☒ Test
☐ Excavate
☐ Controlled Collection
Code (6) Other interpretive roadside stop on bluff east of the river.

NOTES:

Backhoe trenching on the right-of-way to locate buried cultural level (holding camp).

28. B) Management Actions/Recommendations FOR OFFICIAL USE ONLY

29. Bibliographic References:

- A) Jale L. Morgan. Ferries of the Forty-Niners. Annals of Wyoming, Part III - Section 32 (April 1960): 51-69.
B) Aubrey L. Haines. Historic Sites Along the Oregon Trail. Palrice Press; Gerald, Missouri 1981.
C) emigrant journals

30. Attached Data (Check as Appropriate)

- | | |
|--|---|
| ☐ Prehistoric Site Form | ☐ Site Detail Map(s) |
| ☒ Historic Site Form | ☐ Feature/Artifact/Structural Drawings |
| ☐ Architecture Site Form | ☒ Photos |
| ☒ Site Location Map(s) | ☐ Sample/Collection Forms |
| ☐ Other (Specify) _____ | |

Other Data Available (List photo numbers/field notes and maps, etc. reference numbers)

WY 7B- B2 Roll #1 Frames 7,8 looking east

31. Additional Information (Indicate Item #):

16. land, then walk in roughly 3/4 mile to the site.

Signature of Recorder Barbara J Hickman

Date 15 September 1991

WYOMING HISTORICAL SITE FORM

Site Number: State 48 5/W/1/B/4/B/ Fed. _____ Other Lombard Ferry FFR-4

Cultural Affiliation: 3/ How Determined: primary and secondary historical source material. Euro-American.

3) Historical Theme(s): 1) 2/2/ 2) 1/2/ 3) 1/5/ 4) 1/1/ Transportation, Overland Migration

4) Site Type: 3/3/ Ferry

5) Exact Date of Site (if known) _____ How Determined historic source material
1842-1849 Mountain men ran ferry; 1848-58 Mormon Ferry; 1889 to early 1900s William Lombard operator

6) Site Description (Summary Description/Note any important information not described elsewhere on the site form) Location of a ferry used by emigrants and early settlers to cross the Green River during months when the river was too high to ford. The ferry is on the Salt Lake City Road - Fort Bridger Route of the Oregon-California Trail. William Lombard later homesteaded the site and ran the ferry.

7) Site Size (in meters): Longest 396 M; Shortest 122 M; Orientation of _____
30 acres Longest Side NW-SE; Square Meters Surface (L X W) 15/;
 Depth 8/

8) Features Observed

- | | |
|---|---|
| ☒ Standing Structures | ☒ Mining Equipment/Machinery/Implements |
| ☐ Foundation/Depression | ☐ Mine |
| ☐ Corral/Fence | ☐ Railroad Equipment/Machinery/Implements |
| ☐ Bridges | ☐ Ranch Equipment/Machinery/Implements |
| ☐ Native American Structures/ | ☐ Hearths |
| ☐ Religious Sites | ☐ Trash Dumps |
| ☐ Burial/Cemetery | ☐ Utility Poles/Equipment |
| ☐ Cairn | ☐ Domestic Items |
| ☐ Inscriptions | ☐ Well/Cistern |
| ☐ Farming Machinery/Equipment/ | ☐ Energy Development/Equipment/Implements |
| ☐ Implements | ☐ Car/Truck |
| ☐ Irrigation Equipment/Ditches | ☐ Historic Debris* |
| ☐ Logging Equipment/Implements | ☐ Other Trail |
| ☐ Military Equipment/Machinery | |

*Historic Debris should be entered only if an archeologist or an historian cannot associate the historic material to a specific historical site type.

Describe Types of Features

None observed on surface except for the trail swales.

9) Artifacts Observed

- | | |
|--|--|
| ☒ Leather | ☒ Wood |
| ☒ Ceramics | ☒ Barbed Wire |
| ☒ Glass | ☐ Metal |
| ☒ Cans | ☒ Other Diagnostic Artifacts |
| ☒ Cartridges | ☒ Other Non-diagnostic Artifacts |

Describe Types of Artifacts

1 iron wagon wheel rim.

Faunal Remains Observed ☒; Describe: *none*

Floral Remains Observed ☒; Describe: *none*

12) Sample Collected ☒ ☐ ☐; Describe type of sample, collection method, sample or artifact number:

Where curated? *UW*

13) Research Potential ☒ ☐ ☐ ☐ ☐ *Travel, Transportation, Migration*
Discuss research topics, methods and questions

14) Title Search Completed? Yes ☐ No ☒

15) This Site's Relationship to Other Historic Sites (List Smithsonian Numbers When Applicable) *48SW827 Emigrant Trail*

16) Past Use(s) *transportation*

17) Specific Present Use(s) *rangeland, grazing*

18) Attached: (Please check appropriate boxes)

- ☒ USGS map showing site locations, boundaries, number, size, relationship to project
- ☐ Sketch map of site showing distance and relationship to project, boundaries, features, artifacts, collected artifacts and samples, impacts and disturbances, north arrow, symbol legend, site number, scale, prominent natural features and man-made features, etc.
- ☐ Drawings of site, features and/or artifacts
- ☒ Photos of site, features and/or artifacts
- ☐ Additional sheets explaining any points which need clarification or additional information
- ☐ Other

19) Additional Information (Indicate Item Number)

Haines (1981) cites that other investigators (Paden, for example) reported stone structure foundation remnants on the west bank. During this inventory, such features were not apparent.

*Lombard Ranch T22N, R109W Section 18 NWNE
owned by Andrew Pal B. 17 1948*

BLANK

PAGE

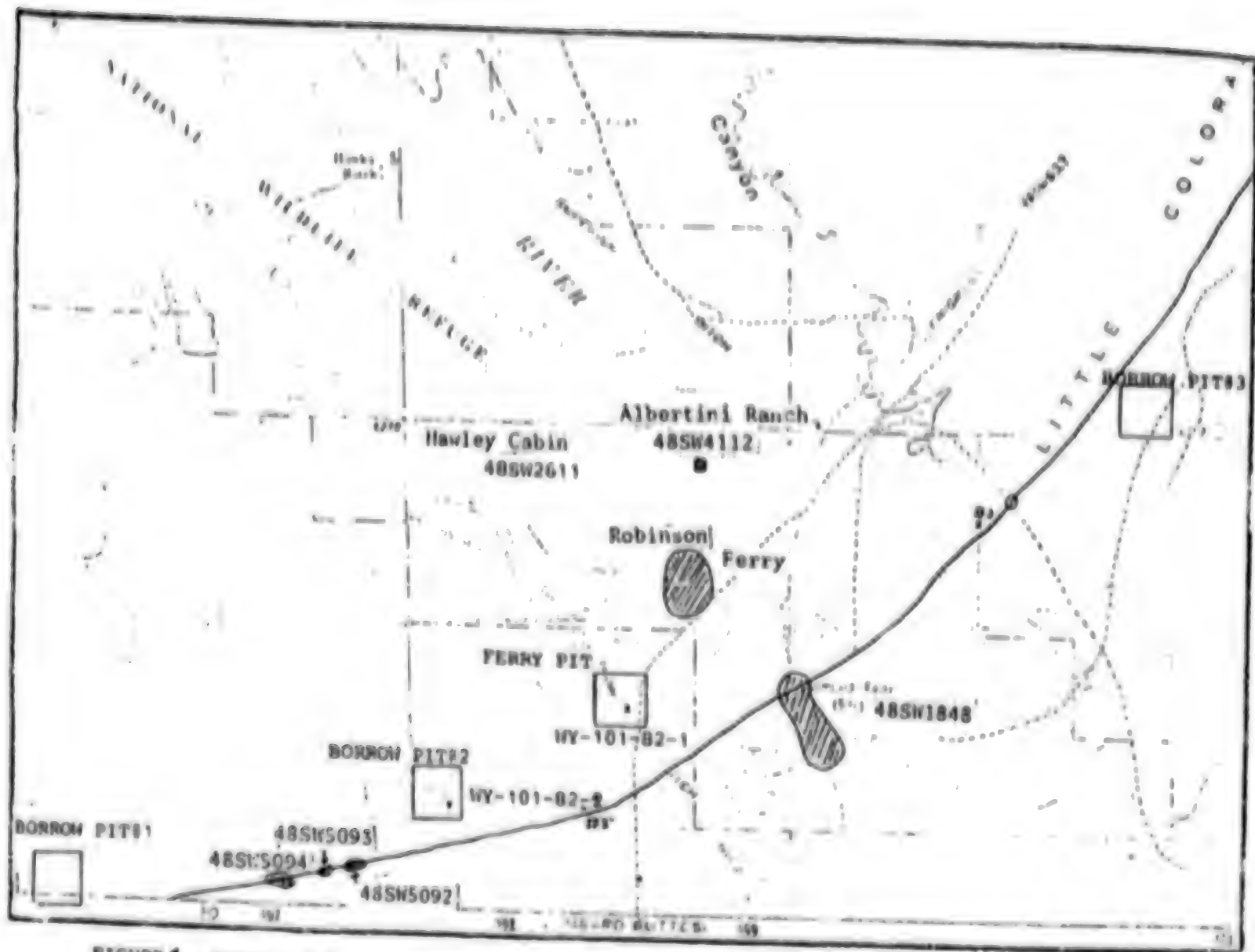


FIGURE 1. Proposed Farson-Fontenelle Road. WHD (SCP-7876). T22N, R109W Sections 23, 24; T22N, R109W S. 19, 18, 17, 8. Thoman School Quad 7.5' Series, Sweetwater County, Wyoming.

----- Emigrant Trail
 ————— Right-of-Way

Corridors 3rd Investigator: WRC Huxford Lusk Date: 4/8/50
Soils VI Site Name: Lambert Ferry Rd
Geo Qal Project: _____
Location: T. 22N R. 109W Sec. 17 1/4 Sec.: _____
County: Shawnee Map Reference: Thuman School
Other: _____

Site Description (type, condition, disturbance, size, etc.): Upland

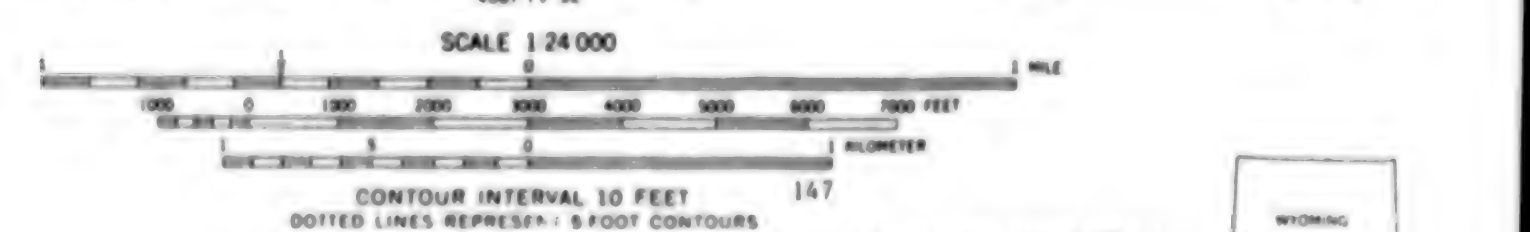
Topography and Environmental: _____

Elevation: _____, Soils: _____

Vegetation (on site and nearby): _____

Recommendations: _____

Materials Collected and Catalog No. _____



into 13
side 11
to Tb
over 11

Investigator: WRC Historic Division Site No.: 48 SW 1314
Date: _____ Site Name: Big Sandy Stage Station
Project: _____
Location: T.: 23N R.: 100W Sec.: 19 1/4 Sec.: _____
County: Summit Map Reference: Garrison Bridge?
Other: UTM 12:608260E 4645340N

Site Description (type, condition, disturbance, size, etc.): Wickie
only known stage station that followed the Ft Bridger route

Topography and Environmental: _____

Elevation: _____, Soils: _____

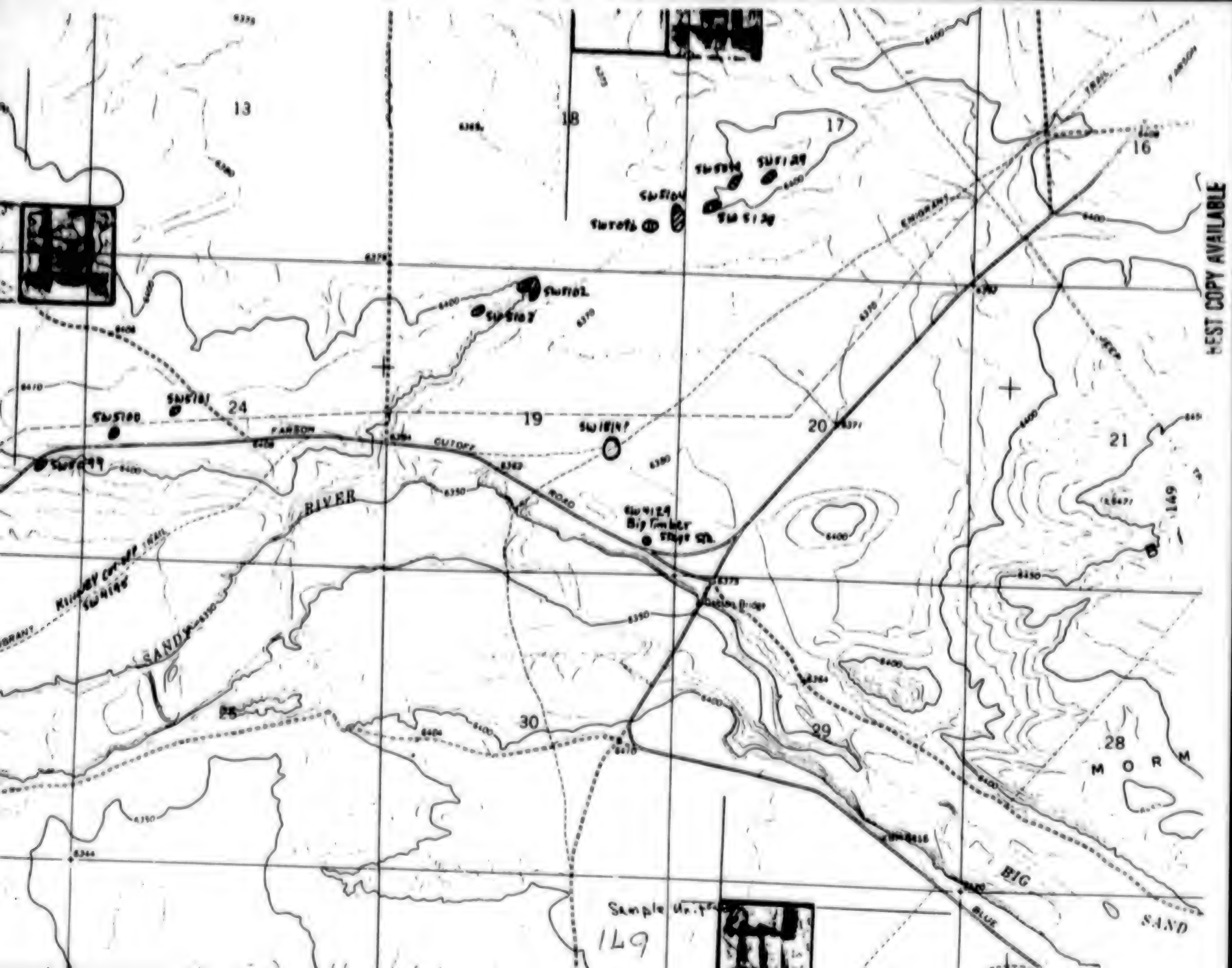
Vegetation (on site and nearby): _____

Recommendations: nominated to the National Register

Materials Collected and Catalog Nos. _____

BLANK

PAGE



BEST COPY AVAILABLE

Sample Unit
149

BLANK PAGE

**Seedsakadee Cultural Resources Assessment Project:
Report to the Branch of Remote Sensing, National Park Service**

LuAnn Wandsnider and Signa Larralde

**Chambers Consultants and Planners
2015 Yale Blvd. SE
Albuquerque, NM 87106**

February, 1984

ABSTRACT

In July and August, 1983, an innovative survey directed at assessing archeological survey methodology--the Seedskaadee Project--was completed by Chambers Consultants and Planners archeologists on Bureau of Reclamation lands surrounding the Fontenelle Reservoir in southwestern Wyoming. The Seedskaadee Project is a carefully controlled 5-meter interval survey of 25 randomly selected 500-x-500-meter quadrats in a variety of geomorphological zones. Labor was divided between three task special crews who respectively discovered, mapped with an electronic distance meter, and recorded attributes of several thousand artifacts and features in the sample units. This distributional approach to archeology specifies that artifacts are the units of discovery and analysis rather than sites.

A wide variety of distributions of prehistoric items was recorded, ranging in frequency from zero to almost 1700 items per sample unit. Two data quality control tests were incorporated into the project: an artifact seeding test on one sample unit to measure discovery crew accuracy and a lithics recording consistency test to measure recording crew precision. Upon completion of fieldwork, the data were formatted, entered into the University of New Mexico computer, and are now on tape. The Statistical Analysis System (SAS) was employed in initial exploration of two research questions pertinent to the data base: identification of sources of discovery bias and the feasibility of various spatial analyses. Twenty-three of the 25 quadrats are recommended for nomination to the National Register of Historic Places.

ACKNOWLEDGEMENTS

Many generous people have contributed their time and ideas to this project. Eric Ingbar donated numerous uncompensated hours in co-authoring the proposal. The field expertise of our crew never ceased to impress us. Tom Peebles and later Colin Garvey as Discovery Crew chief, Ethan Gell, Karen Kramer, Bill McMillan, and Barbara Cox as field assistants, were patient and enthusiastic as we transformed our untested methodologic ideas into day-to-day fieldwork. Anne Peebles and Sylvia Miller were inquisitive, careful lithics coders. And Doug Mau as rodman was Moses incarnate with a prism-topped staff.

Fieldwork began on July 5, 1983, and ended on August 26th. The first two 10-day sessions were spent in a field camp near a cove of Fontennelle Reservoir. Through the kindness of Bob Bucovic, Bureau of Reclamation Fontenelle Power Plant manager, the abandoned dormitory at Fontenelle became our home for the last two sessions, a big improvement. Bob provided for the recharging of the mapping crew battery during the entire project and shared his fresh garden vegetables with us as well.

Thanks are due to Eileen Camilli for suggestions and expertise in designing and lab-testing the lithics field coding form, and to Steve Creaseman and Dudley Gardner of Western Wyoming Community College and Kevin Black of Metcalf-Zier Archaeological Consultants for help in finding experienced crew members. Tim Kearns donated lithic raw material for the consistency test assemblages and made part of the assemblage. Jack Bertram manufactured the remained.

Dwight Drager and Arthur Ireland of the Branch of Remote Sensing in Albuquerque helped us set up sample units and boosted crew spirits by providing several cases of beer. Last but surely first in our hearts is the COAR, Jim Ebert, who not only designed the methodology we used but has been a constant source of support, ideas, and critical wit since the project's inception.

I. INTRODUCTION

During July and August 1983, a revolutionary survey project was conducted on Bureau of Reclamation lands surrounding the Seedskadee Wildlife Refuge in southwestern Wyoming. The survey was contracted at the direction of the Upper Colorado Region of the Bureau of Reclamation by the Branch of Remote Sensing of the Southwest Cultural Resources Center of the National Park Service to the Albuquerque office of Chambers Consultants and Planners.

In the course of this project, 25 units, each 300 meters on a side, were surveyed at a 5-meter transect interval. All artifacts, prehistoric and historic, found on the surface of these units were mapped and described. In a total of 369 person days, some 10,760 prehistoric artifacts and 66 features were found, mapped and described.

Following the fieldwork, the contract between Chambers and the Branch of Remote Sensing was extended to allow proofing and preliminary analyses of these data. One hundred and forty-five computer files were created and initial manipulation of these files was begun.

This report is divided into seven sections. The first section, I, introduces the report. Section II describes the operation of the field survey procedures, and the success of the procedures is evaluated. In Section III, the Seedskadee data base, in its raw and computerized forms, is described. Section IV considers questions of quality control of parts of the survey procedure. It specifically looks at the accuracy of the discovery procedure and at biases introduced into the data base by different attribute coders. In Section V, we report results of our preliminary analyses. We take a closer look at discovery bias, and a program for informed spatial analysis is introduced and critiqued. National Register recommendations are presented in Section VI. Finally, in Section VII, we make recommendations for further investigations using this data base.

II. ORGANIZATION AND EVALUATION OF FIELD ACTIVITIES

In this section, we first detail the organization and operation of field activities. These are then evaluated in terms of efficiency of operation and accuracy of produced results.

CREW ORGANIZATION

Three specialized crews participated in the survey of the project area units. They included (1) a discovery crew, which was responsible for locating artifacts, (2) a proveniencing crew, which was responsible for mapping artifact distributions, and (3) an artifact attribute coding crew, which described each of the discovered artifacts. In addition, another intermittent crew was responsible for locating and preparing a unit for survey. The operation of each of these crews is described in the context of the entire survey process (discovery, mapping and description) that each unit was subjected to.

Although the possibility that crew size and rosters would need to be flexible had been anticipated (Ingbar, et. al., 1983:2.6), we underestimated the extent to which crew flexibility was necessary. Seedskadee field operations very much reflect situational adjustments on a unit-by-unit basis, depending on unit artifact density and crew scheduling as seen in Appendix I. Repercussions of this approach will be discussed below and evaluated in the next section.

Unit Preparation and Artifact Discovery

The discovery of artifacts in each survey unit was accomplished by first locating the unit and establishing line controls for the discovery crew. Once these controls were present, artifact discovery could proceed.

Unit Preparation

Unit location simply involved correctly reading the appropriate USGS quad sheet (which had been provided by the Branch of Remote Sensing) to find the previously plotted survey units on the ground. Once located, corners were identified and staked with 2 ft. or 4 ft. lath flagged in pink. Corner angles were maintained with a Brunton compass corrected for the deviation between magnetic and true north. The five hundred meter sides were measured with a hundred meter tape provided by the Branch of Remote Sensing. At the same time that the unit corners were staked, two alternate sides of the unit were flagged at 25 meter intervals using blue pinflags. These control lines were used by the discovery crew to align and realign themselves with each transect sweep. As discussed below, accurate sweep location was critical to maintaining an even and complete coverage of the unit. The COAR, assisted by two project members, prepared several units in advance for the discovery crew. Generally, between 2 and 4 units could be prepared or "set-up" in a day.

Artifact Discovery

The discovery crew was made up of four crew members and a crew chief. Each person walked a constant five meters from the adjacent crew members. This led to a transect sweep which covered 25 meters in width. Close control of the sweep lines was maintained by use of tall flagged poles or shovels to mark ends of transect sweeps rather than by having a crew member lay pin flags to guide the return sweep. We quickly observed that 1) the opposite side of the 500 meter long sample unit was visible from the starting side and 2) compass bearing were not precise enough to reliably guide sweeps to their designated flagged end points, given the 5-meter survey interval. Visibility was usually good enough so that a flagged end point on the line of either the crew chief or the outside lineman could be used to steer the sweep. After several units' experience at walking the same positions, the crew developed a sense of precision and self correction. This in combination with end-of-sweep visibility helped to insure uniformity of ground coverage. In units with relief that obscured flagged beginning or ending markers, it was the responsibility of the crew chief or outside lineman to maintain line visibility by planting auxiliary flags to guide the sweeps.

Each crew member maintained the same sweep positions for the duration of the survey of each particular unit and these sweep positions were noted by the crew chief on the discovery form. During each transect, every crew member (including the crew chief) flagged all observed artifacts and features with orange pin flags. Once a flag was placed, movement "behind" the flag was not allowed. This to some extent limited the effect of spending more time looking in areas where things were found, which would bias the regional picture and sample comparability. As flags were placed, each crew member counted his or her own flags with a mechanical tally counter or "clicker". At the end of each pass, the crew chief noted each person's total flag count for that transect on the discovery form (see Appendix 2 for complete discovery forms). Time and general comments on terrain, weather conditions and insects were also recorded.

Although no movement was allowed "behind" a placed flag, it is our impression that more time is spent looking where things are found, not only by the crew member or members who first do the finding, but by the whole crew. The crew tends to slow down as artifact density rises and to look at the ground more intensively. Even if only one person is locating artifacts, the other four cannot continue at the same speed and maintain the integrity of the sweep. Usually when the crew is standing around, waiting for one crew member to resume survey, they are likely to find more items themselves.

In high density areas, one flag was used to mark more than one item. Accurate counts of items are harder to maintain under these circumstances. The procedure for these areas took two forms: the first was for the discovery crew to slow down enough to flag most items, with the knowledge that the remaining items in the concentration would be red-flagged in the future; the second was for the discovery crew to slow to a virtual crawl in the effort to flag all items. This last procedure was only followed on one unit, Unit 28. Results of both procedures will be evaluated below. When artifact or firecracked rock density was high the number of flags placed has little relationship to what was actually seen by the discovery crew.

As mentioned above the crew chief completed a discovery form recording the number of items located by each crew member at the end of each transect sweep. This information was used in planning the work of the other two crews. The mapping and recording crew chiefs also relied on discussions with the discovery crew chief for summaries of artifact density and distribution in planning their work on "discovered" sample units.

We estimated in the technical proposal that the discovery crew would be able to cover at least one sample unit per day, and this estimate was fairly accurate. Maximum unit completion by the discovery crew averaged approximately one and a half units per day, depending on unit priority, on proximity of other units to be discovered, and on work scheduling with other crews.

Artifact Proveniencing and Unit Location

This section describes the activities of the mapping crew and also recounts how artifacts in dense concentrations were provenienced.

Point-Proveniencing of Artifacts and Unit Location

The ultimate goals of the mapping crew were 1) to locate as accurately as possible the artifacts marked by the discovery and analysis crews and 2) to take instrument readings which would allow the actual location of the survey unit on a 7.5-minute quadrangle USGS map.

Mapping crew personnel consisted of a full time crew of two, one person to walk about the unit with the prism mounted on a rod and one person to operate the EDM. From time to time, a scribe was present to record measurements made by the EDM operator. This greatly facilitated the artifact mapping.

Mapping crew equipment consisted of a Sokkisha-Liets Electronic Distance Measuring theodolite (EDM) accompanied by battery packs, a rod, and several different sizes of prisms, all supplied by the Bureau of Reclamation. The EDM was capable of making distance measurements to the nearest centimeter and angle measurements to the nearest second, even over distances as great as 1.7 kilometers. In addition to these vital pieces of equipment, a deep cycle battery and recharger were supplied. The EDM required DC current to operate. The truck could not always be brought close to the mapping station and the small battery packets could sustain only about 4 hours of concentrated shooting, so this large battery was often utilized. When however, few shots were to be taken or the transit had to be transported over great distances, the smaller EDM battery packs were used. Through the kindness of Bob Bucovic at the Bureau of Reclamation Power Plant, Pontenelle Dam, we were able to maintain constantly charged batteries.

The Branch of Remote Sensing also supplied two set of two radios for coordinating shots and shot numbers between members of the mapping crew. One set of personal radios were lightweight and easy to activate, hence very comfortable and convenient to use. Unfortunately, their range was greatly influenced by topography and vegetation and they usually became ineffective

at between 300 and 600 meters. Part way into the season, one of the small transmitters became impaired. We then relied fully on the large Lafayette Walkie-Talkie supplied by the Branch of Remote Sensing. These were unwieldy for the high mobility rod person who also had to carry the cumbersome rod and prism as well as the retrieved pin flags. Nevertheless, the limits of their range extended beyond our needs, and generally they worked fine. It should be emphasized here that without at least one way communication between the prism bearer and the EDM operator, the efficiency of artifact location would have been severely impaired. Hands signals were, however, successfully employed on those rare occasions when radio communication was impossible.

Upon arriving at a unit that had been "discovered" by the discovery crew, the first (and in many cases, only) mapping station was established. The location of this mapping station was chosen by referring to a 7.5 minute USGS sheet for topographic highs inside or just outside the unit and by verifying that most or all flagged artifacts could indeed be seen from that vantage point. Once the station location had been chosen, the instrument was set up and batteries were installed or hooked up. Temperature and atmospheric pressure readings were taken and the instrument was adjusted for these environmental conditions. The transit notebook was "set-up" for the unit by estimating the number of artifacts to be recorded and then writing out as many numbers in the shot number column. The rodperson attached one of the prisms to the rod and the rod was extended to a demarcated height. The prism height, recorded at this time, considered not only the height of the rod, but also the distance the rod sank into the ground. The rodperson then checked the radio batteries on both walkie-talkies and before proceeding out into the unit, liberally lubricated him or herself with sunscreen and insect repellent and imbibed a quart of water.

Meanwhile, the instrument person leveled and zeroed the instrument. An arbitrary horizontal 0 degrees was chosen to be a convenient corner of the unit. This was preferred over using a north reading since magnetic north can vary during the day and because the compass on the EDM was neither accurate nor precise. This daily set-up procedure took about 15 to 30 minutes.

Once the instrument was set up and zeroed, the actual shooting of flagged artifacts could begin. Two different procedures were used. If the analysis crew had already swept through the area and numbered the artifact flags, then the rodperson proceeded from artifact to artifact reading the numbers over the radio to the instrument person and, after the shot had been taken, pulling the artifact flag. If the mapping crew preceded or arrived at the unit simultaneously with the analysis crew, then a block of shot numbers was assigned to the mapping crew. As the rodperson moved between artifacts, he or she numbered the flags accordingly and called back the number to the instrument station, in this case leaving the flag for the analysis crew to pull. In either case, once a shot number was given to the person operating the EDM, the number was located in the prenumbered shot book. In this fashion, redundant numbers were quickly identified and dealt with as described later on. Upon finding the unique shot number in the transit notebook, the color of the flag was denoted with an R for red and an O for orange. Three readings were recorded by the instrument person; the other two were written down by a scribe donated by one of the other crews. When

a scribe assisted in the mapping procedure, the time required to shoot each artifact was halved.

The acuity of the rodperson was critical to the smooth and efficient operation of mapping. It was impossible to see the distribution of all of the flags from the mapping station, so the person at the instrument, although on high ground and having a telescope at hand, could not direct the rodperson to artifact flags. This meant that the rodperson had to systematically cover pieces of the unit so as not to accidentally leave behind flags. The rodperson was assisted in this to some extent by the blue flagged boundaries of the unit which he could use as a guideline. Generally, Doug Mau, who served as rodman for 6 weeks of the 8 week season, was able to organize his sweeps so that he would circle back to the instrument station every 2 and one half to 3 hours after covering a discrete section of the unit. At this time, he deposited the heavy pinflags he had collected and tanked up on water again.

While the rodperson was trekking across the unit between artifacts, the instrument operator engaged in several other activities. A 14 inch rebar was driven into the ground at the first transit station in each unit. A surveyor's tag was attached to the rebar, bearing the following information:

SCRAP
Unit #
Date

Additionally, several readings on the horizontal angle of magnetic north to the nearest minute were made. The average of these was recorded, as was instrument height.

In addition to recording location measurements for artifacts, the four unit corners were located as were the corners of the provenience grids of the high artifact density clusters. If other stations were needed to completely map artifact distributions, then the locations of those stations were of course recorded. Finally, distances and angles to the most convenient or visible benchmark or section corner were measured. If this was impossible, then some other landmark, readily identifiable on both 7.5 minute topographic sheets and in the field, was shot to. With magnetic north readings and shots to a least one other point on the USGS quad sheets, the unit can be located in space. See the accompanying topographic sheets (Delivered Item 1) for actual locations of the survey units.

In the manner detailed above, point provenience measurements for some 6000 artifacts located in 25 survey units were obtained. The corner location of approximately 35 grids (of 1 meter cells) which provenience another 10,000 artifacts were also recorded. Also, shots to some unique landmark enabling the unit to be tied into the USGS mapping system were recorded. These records fill the five transit field notebooks (Delivered Item 2) which accompany this report.

Grid Proveniencing of Artifacts

In the technical proposal, two contingencies were developed for dealing with extremely high artifact densities in sample units (Ingbar, et. al. 1983:2.15-2.18). The first contingency involved sampling artifacts within high density units. The second contingency involved describing and proveniencing all artifacts in each unit, even if the distribution was very dense, and, if necessary, surveying fewer units. The dense clusters of artifacts were to be mapped using a grid system of one-meter cells. In order to maintain spatial scale comparability of artifact distributions, the COAR opted for the second of these contingencies, decreasing the number of sample units to be completed.

This decision was implemented early in the season when Unit 8 was surveyed by the discovery crew and 1152 objects were flagged. As the recording crew started work on the unit, it soon became obvious that artifact density was at least double and possibly triple the orange-flag count. In order to deal with this artifact density, several procedures were instituted based on data collected during the first 10-day session; 1) the number of lithic attributes to be recorded was reduced and some time consuming attribute measurements such as weight were eliminated; 2) concentrations were gridded in rectangles composed of one meter grid squares, and provenience data was recorded by grid squares rather than by point proveniences.

Typically, a concentration was first red-flagged so that its dimensions could be estimated, then fitted with a grid, which was set up with tape and compass. Grid corners were staked with lath, and were shot in with the EDM. Blue pin flags were placed at two meter intervals around the grid perimeter to facilitate laying out tapes and grid ropes by the recording crew. This process was delegated to discovery crew or recording crew members, depending on which crew was available to do the work and depending on individual skills. The recording crew inventoried grid contents using the "movable grid" system: ropes marked off at one meter intervals, numbered pinflags and 30 meter tapes were used to define two meter transects within the grid. Dimensions of one meter grid squares (the recording unit) were estimated within the marked two meter squares, and all artifacts were recorded within these one meter units. Thus, an artifact would have the provenience of unit number, grid number, grid northing, and grid easting. As adjacent transects were completed, ropes and tapes were moved from west to east, defining new two meter wide transects within the confines of the grid, until the whole grid was done. Grids were numbered sequentially starting over with each sample unit, and Grid Forms (see Appendix 3) were used to describe grid dimensions and topography.

In this fashion, 48 grids were used to provenience some 5,000 artifacts in 10 different units.

Attribute Recording

The recording crew was composed of three experienced lithic analysts who worked ahead of the mapping crew or with that crew. In high density units, as many as five recorders made up the crew. Forms were modified during

fieldwork (with the permission of the COAR) as an adjustment to recording time constraints, changes in information priorities, and recording convention clarifications. Examples of original field coding forms are included as Appendix 4. Appendix 5 is a list of variables and codes consistently used after form modification.

Ordinarily recording crew tasks were delegated after a reconnaissance of the artifact distribution of the unit, either through information provided by the discovery crew or through visual scans from high points on the unit. Initial decisions were made as to which areas were likely to require grids. Optimally, these areas were red-flagged and their grid corners were set first. The recording crew then coded isolated items outside grid boundaries. Grids were completed last.

Each crew member was equipped with a legal-sized clipboard, a pad of FORTRAN code sheets, two coding forms printed on durable plastic sheets (one for lithics, one for historic items), a six inch centimeter-ruled ruler, a mechanical pencil, and a supply of Feature Forms, graph paper and collection envelopes.

To begin a unit, consecutive blocks of numbers were delegated to crew members by the crew chief based on the anticipated number of items in the unit. During coding, a recorder wrote the item's number on its pin flag with an indelible ink pen, then recorded the item number and the item's attribute codes on the unit's FORTRAN sheets. Item numbers were prefaced by the sample unit number. As pinflags were reused, a mish-mash of numbers collected on them, and the sample unit preface was necessary to avoid confusion as to the flag's current item number. New blocks of numbers were assigned as old blocks were used up. Usually the unit was roughly divided into sectors to be covered by each crew member. Alternatively, broad sweeps were made by the recording crew when artifact density was high over the entire unit. Additional forms were collected at the day's end and kept in a portable file for reference if the unit was not completed, or filed at camp if the unit was done. These forms containing the descriptions of all artifacts constitute delivered Item 3 (Prehistoric Artifact Description) and 4 (Historic Artifact Descriptions). Completed Feature Forms constitute Appendix 6.

Several attempts were made to speed up the recording process by having one crew member scribe for another. Although useful in training new recorders, scribing seems to be much more time consuming than two trained recorders working independently.

During the first half of the survey, temporally diagnostic artifacts were photographed and drawn (Appendix 7 lists these photographs). During the second half, they were drawn and collected (Appendix 8 is a list of collected items). These items will be curated at the Wyoming State Historic Preservation Office in conjunction with the University of Wyoming Anthropology Department, Laramie.

Artifacts found by mapping or recording crews were flagged with red pinflags. The distribution of red-flagged items is highly biased toward existing, i.e. orange-flagged, artifact concentrations and does not represent a systematic effort to re-survey smaller areas of the sample units. Ordinarily, recording or discovery crew members would red-flag a

concentration either in the course of recording artifacts when it became obvious that the concentration was much denser than the orange-flagged distribution indicated, or when it was decided to grid a concentration and the dimension and density of the concentration had to be known before grid corners could be set. In red-flagging, crew members "milled about" the concentration, flagged artifacts on an encounter basis. Consequently, we believe that orange-flag survey data is comparable in ground coverage but red-flag data is essentially similar to site oriented survey coverage, i.e. coverage is non-comparable.

Crew Scheduling

Because of the high variability in artifact density from unit to unit, the coordination and scheduling of crews was an important consideration. The discovery crew's tasks were most redundant from unit to unit and required no internal adjustments. Scheduling adjustments were required between the discovery crew and the other crews, however, when 1) the overall artifact density was high (i.e. 500+ artifacts); 2) artifact density as observed by the recording crew was substantially higher than reported by the discovery crew. Either eventuality caused the mapping and recording crews to lag far behind the discovery crew. We observed that the duration of these time lags was directly proportional to the number of fallen or wind mangled orange flags and to the instance of flags marking artifacts that could not be refound by subsequent crews due to burial or other natural processes. A similar problem occurs when there is a time lag between recording and mapping. After approximately two weeks, the "indelible" ink fades off the flags and items must be re-recorded because their identification numbers are no longer legible.

To cope with these problems, some members of the discovery crew were trained to record artifacts and others were trained to carry out other mapping and recording crew tasks. When it was clear that several days would be required to complete a unit, discovery crew members red-flagged concentrations, set up grids, laid out new sample units, scribed for the mapping crew and recorded artifacts. As Appendix 1 shows, crew schedules remained flexible during the entire project. Also, work was scheduled so that the mapping and recording crews worked together on sample units; this avoided numbering confusion and errors.

EVALUATION OF OPERATIONS

In general, the methods which we designed for discovering, mapping, and describing artifacts before going into the field served remarkably well. We have but a few suggestions to make for improving the work of future archeological surveys of this type. These suggested modifications are aimed at increasing the efficiency of the field operation, the accuracy of the results, and the information content of the data base. For each of the procedures of discovery, proveniencing, and description, recommendations are made below.

Evaluation of Discovery Procedure

Daily logs were used as a replacement for daily field notes, and were to be filled out by the discovery, mapping and recording crew chiefs. These proved to be time-consuming and the information asked for on the forms was not always pertinent to our current or future needs. Of the three crews' daily logs, the discovery crew's log was the only one to be used consistently in work scheduling, as we anticipated. The daily log form should be replaced by a form designed specifically for each crew and incorporating information specific to that crew in an easy to use format.

Specific environmental data for each sample unit should be recorded during fieldwork. These data could be collected most easily and most systematically by the discovery crew chief. Data should include specific descriptions of vegetation, soils, degree of ground visibility and microtopography not recoverable from topographic maps. If the project area has been environmentally stratified, a comparison of unit stratum vs. unit contents would be apt. Also included should be some assessment of recent impact on the unit (i.e. roads, construction), as well as an indication of the distribution and frequency of cultural resources found by the discovery crew. This information aids in work scheduling for the discovery and mapping crews. The recording format might take the form of photocopied enlargements of topographic maps for each unit which could be used as base maps on which to sketch in vegetation communities, topography, recent impact, and artifact distribution.

Completion of forms should be monitored during the project to make sure that necessary data have been collected while in the field. In particular (for the discovery crew) sweep conditions should be more thoroughly recorded. The discovery crew chief should also photodocument each unit with two or more characteristic shots.

Efficiency of the discovery crew would be enhanced by improvement in the design of the sweep and markers. Telescoping aluminum poles with screw-on shovel blades at one end would be ideal. The poles should be painted with fluorescent strips and flagging tape should be affixable for maximum visibility. In addition, crew time could be saved by installing color coded bins or small barrels in the trucks for organizing pin-flags.

As for intensity of survey, we favor the procedure used in Unit 28, in which the discovery crew slows down as much as necessary to record all artifacts. This eliminates most red-flagging of items, speeds gridding decisions, and results in comparable coverage between units. It also uses discovery crew time to best advantage.

Evaluation of Provenienceing Procedure

Efficiency of artifact proveniencing could be increased in two ways. As seen in the Daily Log summary (Appendix I), the number of artifacts mapped depended somewhat on whether a scribe could be commandeered from another crew. Had a data logging device been available for use with the EDM, many more shots could have been taken each day. Another consideration not reflected in those shots-per-day figures is how scattered throughout, a data logging device would not have increased efficiency, but certainly data transcription once out of the field would have been infinitely enhanced.

A second way to increase mapping efficiency and accuracy involved reducing boredom. By trading off specialized and redundant jobs between competent personnel some of the boredom inherent to the EDM operator's task and the rodman task could be alleviated. This modification, of course, requires that both be proficient at each job, yet such a trade-off might introduce operator inconsistencies into the transit readings. We also suggest that both be skilled in artifact attribute coding so that on low artifact count units, analysis and mapping can proceed simultaneously and the recording crew can work elsewhere.

The accuracy of locating point provenienced artifacts depends on the quality of the EDM and the care with which it is used and maintained. At this time, few changes in policy can be suggested which would increase the accuracy of this procedure. The locational accuracy of grid-provenienced artifacts, however, depends on the skill and care with which the grids are laid out and used. In that there were many steps and sometimes many people involved in the set up of the grids, there is greater opportunity for error to creep into the grid provenienced locations. A primary suggestion for increasing the accuracy of proveniences obtained through this system is that more care be taken in laying out grids. Grid dimensions should be double checked prior to the start of artifact recording, preferably by use of diagonal measurements. Reliable ropes are necessary for use in grid control. Cotton ropes wrapped with electricians tape were constantly out of calibration and were eventually abandoned as one meter guidelines and used only to guide transects. If possible, 30 or 50 meter tapes should be used exclusively instead of ropes. If not possible, a non-stretch rope should be permanently marked at meter increments by interweaving the markings or by dyes or permanent ink. We also found it useful to use tall pin-flags with large numbers to mark meter increments on the transects; they save the effort of continually checking the number on the tape. Two or three sets of these should be made and stored separately from other pin-flags for use only with grids.

Unfortunately, movable grids must be employed without clearing vegetation. Occasionally large bushes obstruct transect lines and add to grid provenience error. The only solution seems to be in the carefulness of the recording crew in laying out the transects and in proveniencing items within the grid cells.

Another suggestion involves decreasing the grid cell size from 1 to .5 meters. Implementation of this suggestion should await the results of future analyses conducted with the gridded artifacts, as perhaps a grid size of 1 meter is sufficient. Rogers (1983), however, reports that for spatial patterns of size n to be detected, then a grid size of $n/2$ must be employed. Consequently, using the gridded artifactual information obtained from the Seedkadee 1983 season, only spatial patterns of 2 meters or greater can be sought. It seems as though it would be little more trouble to record artifact provenience with a .5 meter cell size; the only constraint is that sufficient space on the coding form be set aside.

Evaluation of Attribute Recording Procedure

Recommendations concerning the recording crew also concentrate on changes in kinds and formats of information to be recorded.

Data Format

A narrative summary of artifact distributions, concentrations and content per unit should be included on the crews' daily log. These observations will supplement and complement the lithic code sheets and will dovetail with environmental data collection by the discovery crew.

Clarification of Data Categories

Although data categories were specified for the recording crew, category definitions should be clearly written out and examples of each category should be on hand for visual inspection. Also, pre-fieldwork lab tests for all data recorders and lab tests during fieldwork are essential in obtaining high quality data, as discussed in Section IV.

We recognize that the categories of items and the number of attributes that can conceivably be recorded are almost limitless. With this in mind, research priorities and legal priorities (i.e. information needed by the SHPO) should define what kinds of items are flagged by the discovery crew and later recorded. Several classes of data caused hesitation and uncertainty in the field, as these priorities were solidified. These included 1) historic items and features, 2) firecracked rock, and 3) fauna.

The research potential of recent garbage scatters has remained untapped; such scatters can in fact yield information on rate of deposition or erosion in an area, if they include temporally diagnostic items or if the occupation data is known. We recorded all items except survey stakes and lath on 7 sample units, but the discovery and recording processes were very time consuming and the practice was dropped as not relevant enough to our research goals to justify the cost. We continued to record items over 50 years of age on remaining units, namely hole-in-the-top cans and associated items. Few of these were encountered. All members of the discovery crew and recording crew must understand guidelines for determining the age of historic items and guidelines delineating categories or items to recognize and record. These guidelines should be written in the pre-fieldwork phase of the project and should include decisions about recording temporally undiagnostic items and features such as tobacco cans, woodpiles and ash dumps. It is quite likely that historic trash scatters, particularly recent ones, are linked to the road network through an area or to other pertinent features such as earthen dams. Since the 50-year limit now brings us into the 1930's and before long will include the World War II era, many of these features were in existence at the time artifacts were deposited. A cut-off date for artifact recording will always be difficult to justify and to enforce given the gray areas of temporal diagnosis. It should be recognized that artifact distributions may not make much sense without distribution information about associated facilities.

Similar problems pertain to recording fauna, namely whether to record

historic fauna and if not, how to recognize proto or prehistoric fauna. We introduce these problems with no well-defined solutions except to note that carcasses in varying stages of decay were a frequent occurrence during fieldwork. The criterion of association or context of fauna with artifacts is difficult to apply, especially in non-site survey. Burning may be one useful criterion for distinguishing cultural bone; fracturing may be another.

Firecracked rock posed recording problems for the duration of the fieldwork. Firecracked rock scatters were quite variable in density and in size of rock fragments. The variability is informative, but criteria must be developed for recording it. For example, diffuse scatters of tiny fragments seem to be telling us something different than dense scatters of whole cobbles. But these differences are not apparent in the data base. Usually, when a firecracked rock scatter seemed to have a discrete, dense distribution its "boundaries" were flagged and mapped by data recorders and a feature form was filled out. In dense amorphous scatters a grid was laid over the concentration. The systematics of recording firecracked rock should, however, be made more explicit. Essentially the problem should be handled the same as for high artifact densities, which means an increase in the number of pinflags needed for future work, and a directive to the discovery crew to treat firecracked rock as artifacts. On the discovery form, no distinction should be made between the two when keeping track of per person artifact counts. But information about firecracked rock distribution should be included on the crew leader's log forms. More detailed attribute studies may prove appropriate as analysis proceeds. Only material and number pieces were recorded; next time, an interval scale for measuring size of pieces should be included.

The recognition criteria for firecracked rock is essentially based on one material, quartzite, and includes oxidation color change from white/tan/gray to pink/red, surface hackling, and increased friability resulting in breakage. Recognition criteria for other rock types is less clear cut and it was never ascertained whether a cinder like probable limestone scoria was the result of cultural burning or a natural rock type occurring in the area; the same problem occurred with sandstone fragments. These parameters should be explored before further fieldwork. Also, there was no clear treatment of unmodified cobbles that appeared to be out of depositional context and were associated with oxidized cobbles or firecracked rock.

Related to these problems is the treatment of lithic sources. Pleistocene gravel terraces and desert pavement with a cobble cover were present in several units. Some means of evaluating a unit's potential for lithic procurement should be incorporated into the discovery and recording crew chiefs' logs. This may best take the form of within-unit sketch maps or potential source areas and of systematic collections of material samples from a unit for later examination by area geological specialists. A systematic effort should be made to find out about, sample and map local lithic sources outside the boundaries of the sample units and even outside the boundaries of the project area.

The success of the lithics form will be evaluated in Section IV.

Equipment and Scheduling

Potentially the most important change in recording crew equipment for increased efficiency is the implementation of a system that eliminates the data entry step undertaken after fieldwork and allows coders to directly input data to a storage battery that could be unloaded on a nightly basis. All intermediate error potential in reading forms and keypunching could be eliminated by using this system.

The recording crew experienced a severe scheduling crunch as artifact density skyrocketed on some units. Using the current recording format (and no major improvements come to mind without sacrificing the number of attributes recorded), the primary solution to this problem is to add more workers. The cost of adding more workers is manifested as 1) debilitation of the discovery crew until the recording crew is caught up; 2) apparent increase in recording crew numbering errors, flags missed, and in recording inconsistency. Also, work must be found for the discovery crew members who are untrained in data recording. During the project, these crew members flagged concentrations, set up grids, laid out sample units, or acted as mapping crew scribes. A maximum of five data recorders were employed at a time.

Because of the need for flexibility in crew scheduling, it is essential to invest time in training at least two members of the discovery crew and three if possible to record attribute data. Resulting errors in consistency could be minimized by 1) hiring crew members with lithic analysis experience; 2) pre-fieldwork training and lab test sessions; 3) periodic consistency tests and check sessions, at least one one-to-two hour session per 10-day work period.

Concluding Remarks

The above represent our suggestions for how a similar survey might be conducted in a similar area. We hope that others can benefit from these suggestions for improved efficiency and accuracy, and realize that a whole new suite of problems will arise when the same methodology is introduced into a new environment. In general, our suggestions can be summarized as the following:

- 1) conduct pre-field work such as the development of appropriate forms, the definition of recognition criteria, and the training of personnel,
- 2) hire trained and competent personnel,
- 3) invest in some reliable high-technology such as an EDM and possibly a portable data entry tablet for they do save time,
- 4) and be flexible.

We subscribed to most of the above before entering the field and in retrospect can attribute the success of the field season to their implementation.

III. DATA ORGANIZATION AND CURRENT STATUS

In previous sections, we have detailed the recovery of artifactual information, both descriptive and locational. In this section, we describe the form of these data as they emerged from the field and the computerized form they have assumed. Finally, the card copies made of this information are described.

FIELD DATA

Because it was anticipated that complex manipulations of the information recovered through survey during this project would be undertaken, most such information was retrieved in a computer compatible form. That is, for chipped and ground stone which comprises the bulk of the artifacts found, only certain variables with a specified number of possible values were recorded. Since we could not fully anticipate the kinds of historic and recent artifacts that would be found, verbal descriptions sufficed. The descriptive formats are described for each type of data recovered through the discovery, proveniencing, and attribute coding processes.

Discovery information consists of the date the unit was surveyed, which crew members assumed which sweep positions, and the direction (north-south vs. east-west) the unit was surveyed in. Additionally, information about the number of artifacts located with each sweep and the beginning and ending times for each sweep were recorded. Data on temperature and weather conditions were inconsistently collected. Appendix 2 gives this information for each unit surveyed. Unfortunately, the Unit 12 Discovery Form has been lost.

Location information for both point provenience and grid corner provenience was transcribed into transit books as described earlier. The information in these five books is organized by day, unit and station. Additionally, Grid Forms were filled out at the time the grids were laid out over dense artifact concentrations. Primarily, these grid forms (see Appendix 3) provide information on grid dimensions and other comments on the grid. Grid corner locations are present in the transit books.

Artifact descriptions for both prehistoric and historic items were recorded in the form of numeric codes written directly on FORTRAN coding sheets. These codes and their translations are shown on the coding sheets (see Appendix 4) which were designed before going into the field and subsequently revised (Appendix 5). Two of the Delivered Items (3 and 4) include the completed coding sheets organized by type of artifact (chipped stone-ground stone vs. ceramic-historic-fauna), by unit, and by field coder.

Miscellaneous data brought from the field include black and white field photographs of uncollected projectile points and features. Contact prints and negatives of these photographs are on file at the Albuquerque office of Chambers Consultants and Planners. Appendix 6 lists and briefly describes these photographs. Midway through the season, projectile points were collected so that they could be further studied. A catalog of these

collected items is given in Appendix 7 and these items will be curated by the University of Wyoming at Laramie.

An inventory of the raw data as it emerged from the field reads as in Table 8.1.

**Table 8.1 Boodskadee Cultural Resources Assessment Project
Field Data**

Data	Reference
Discovery Forms	Appendix 2
Ceramic Historic Fauna Coding Sheets	Delivered Item 4
Chipped Stone Ground Stone Coding Sheets	Delivered Item 3
Transit Books	Delivered Item 2
Grid Forms	Appendix 3
Photograph Log	Appendix 6
Catalog of Collection Items	Appendix 7

COMPUTERIZED DATA

Except for the Photography Log and the Catalog of Collected Items, all of the above described information was entered on the University of New Mexico VSPC/MVS Computer System by the Branch of Remote Sensing. It was anticipated that these data might be used by many different researchers and planners for a diversity of reasons. For this reason, we transformed these raw data files into Statistical Analysis System (SAS) disk files which allow for files, variables, and values to be documented. This insures that the files can be used and maintained with a minimum of confusion. In this section, we describe briefly the SAS transformation process and the current disposition of these data files.

As stated above, all of the computer compatible data was transformed into SAS files now residing at the University of New Mexico Computer facility. These files are contained by the archive SASCRAP which has 6 libraries corresponding in a general sense to the field data sets discussed previously. These libraries, DISCV, TRANS, HISTO, STONE, GRIDS, and FORMATS are discussed in turn. The SAS libraries of SASCRAP can be accessed as shown in Appendix 8 which contains pertinent SAS computer codes. The contents of each library as well as the variables and number of observations

in each of the many library files are given in the BASCRAP archive contents (Delivered Item 5).

The discovery information recorded by the discovery crew for 24 of the 25 survey units is in library DISCV. This library contains 24 files, one for each of the 24 units for which discovery information exists, of the form D1, D2, etc. These files record sweep information for each unit. Additionally, the files DCODES contains information about the discovery of each unit such as the data surveyed, the direction walked, and the sweep position assumed by each crew member. Refer to the BASCRAP archive contents for specific variable names.

Locational information for point-provenienced items, grid corners, unit corners and station are contained in the TRANS library. This library has two kinds of files: those whose names begin with a T and those whose names begin with an R. Whether a T or an R file, the rest of the file name describes the unit number and the station number. For example, file T1A refers to transit shots made in Unit 1. File T4S1A refers to transit shots made from Station 1 in Unit 4 while T4S2A contains transit shots made from Station 2 in Unit 4. The T files consist of the SAS version of the raw data as it was entered in the transit books. That is, they contain azimuth, plunge, and distance reading for each item shot in the field. These files were created using the program TRANSUP (see Appendix 8 for program listing). The R files contain the same information in reduced form. That is, locational information reduced to X, Y, and Z coordinates (easting, northing, and elevation respectively) is found in the R files. Note that the X-Y coordinates were standardized so that the southwest corner is the vicinity of X=100 m., Y=100 m., the northwest corner is in the vicinity of Z=100 m, Y=600 m., etc. In this manner, X increases to the east while Y increases to the north. Also, the elevation of the first station shot from is arbitrarily set at 100 meters. These reductions were made using the program REDUCE (see Appendix 8). The R files, thus, are easily manipulated so that shots made from several stations within the same unit can be collated. Locational information for gridded items is discussed below. Consult the BASCRAP archive contents for file and variable names.

Artifact descriptions are contained in three libraries: HISTO, STONE and GRIDS. HISTO contains files for every unit in which recent or historic items were found and these have names of the form H1, H2, etc. Only three variables are recorded in each file: unit number, shot number, and a short-hand designation of historic (H) or recent (G for garbage). This very simple code was constructed for the purposes of bookkeeping alone and those interested in analyzing the historic or recent artifacts recovered in the course of this survey must refer back to the original coding sheets where more detailed descriptions are given.

The libraries STONE and GRIDS are basically of the same form containing coded descriptions of chipped and ground stone artifacts. Only the provenience information differs between the two. The library STONE consists of 25 files, one for each unit, with names of the form S1, S2, etc. In general, each artifact or feature is described or referred to on one line. In library STONE, variable V2 (shot number) refers to the provenience information for that artifact as found in the corresponding file in TRANS. These files were created from raw data files using the program INPUT (see Appendix 8 for program listing). Library GRIDS contains files for only

those units which required gridding (2, 4, 6, 8, 10, 19, 20, 22, 25, and 28), and these are named S2, S4, etc. Variable V2 (shot number) was not coded for these files, but V34 (grid northing), V35 (grid easting), and V36 (grid number) describe the artifact provenience. The locations of the grids within the units is found in the TRANS file corresponding to that unit. These GRIDS files were created using the program QINPUT (see Appendix 8). Again, the SASCRAP archive contents should be consulted for specific variables and the numbers of observations for each file.

The library SCRAP is a union of artifact descriptions and artifact locations for each unit. In conjunction with the GRIDS library, it is anticipated that this library will be the most used as it melds descriptive and locational data for each artifact from TRANS.R and HISTO and STONE. Thus, each of the 25 files, named U1, U2, etc., contains all of those variables found in the other libraries for each point-provenienced artifact. This library was created using the program MERGE (see Appendix 9 for program listing). See the SASCRAP archive contents for a fuller account of the contents of SCRAP.

The remaining computer library is FORMATS. This is a partitioned data set which contains the translations of value codes for all of the discontinuous variables. This library is automatically accessed by SAS jobs when a particular format is to be attached to a variable. Appendix 5 contains a listing of the existing formats. Interested users should consult an SAS manual to see how these formats can be attached to variables (see PROC FORMAT and the FORMAT statement).

As stated above, general information about the SASCRAP archive is contained in Delivered Item 5. This same document describes the contents of the tape SERD (Delivered Item 6) which contains the most recent version of each of the above described libraries. The index of this tape is provided with the SASCRAP archive listing.

CARD DATA

From the SAS files described above, card copies (Delivered Item 7) were made for library DISCV, GRIDS, and SCRAP. These decks have been delivered to the Branch of Remote Sensing and the card formats for each are given in Appendix 10. Note that the first column of each card indicates whether the card deck is a DISCV file ("D"), a SCRAP file ("S"), or a GRIDS file ("G").

IV. QUALITY CONTROL

The orientation of the Seedskadee Cultural Resources Assessment Project is methodological. The project is chiefly concerned not only with collecting information about the distribution of prehistoric artifacts, but also with evaluating how the collection process influences the reported artifact distribution and disposition. To this end, two types of analyses, geared towards controlling the biases archaeologists inadvertently introduce into their survey results, were conducted. The first of these considers the accuracy of the artifact discovery procedure described above. The second analysis evaluates the consistency with which artifact attributes were coded by the three principal members of the analysis crew.

ACCURACY OF THE SURVEY METHODOLOGY

The intent of the discovery procedure was to discover any and, preferably, all cultural remains visible on the surface. In that a revolutionary and small survey interval, 5 meters, was employed in the survey of the units, it was hoped that the majority of artifacts on the surface of a unit would be seen and flagged by the discovery crew. That is, the survey methodology was designed to allow us to accurately describe the surface archaeology both in terms of content and distribution. Rather than hope that our survey accuracy was high, a "seeding" experiment was conducted as prescribed in the response to the RFP (Ingbar, et.al. 1983:2.11-2.13).

Accuracy refers to how closely a measuring instrument approximates reality. In this case, the question becomes did our discovery method find all of the visible surface archaeology? What kinds of artifacts were missed? This question is to be distinguished from that of precision which refers to how consistent are the results of a measuring device applied to the same problem in the same manner. We were unable to test the precision of our methodology although we recognize how critical this is to evaluating the integrity of the archaeological record.

Whether or not an artifact is discovered is related to both features of the artifact and features of the artifact's context. For example, an artifact with a decidedly unnatural shape becomes more visible to the roving eye of the surveyor as does an artifact which has a color contrasting with that of the surface, or a very large vs. a very small artifact. In addition, attributes of the environment, such as quality of light and density of insects, may influence the discovery of artifacts.

Other factors also contributing to artifact discovery are less easy to measure and include attributes of the surveyor. Eyesight capabilities, degree of boredom, hunger, thirst, bodily discomfort, experience, etc., all affect to unknown degrees the "seeing" ability of the surveyor. More insidious are the conceptual biases each surveyor brings to a project, for no measuring device has yet been devised to monitor these.

In order to assess the accuracy of our discovery methodology, we "seeded" one of the units (Unit 24) with 202 pseudo-artifacts: 107 washers (1.5 cm in diameter) and 95 concrete nails (5 cm in length). Washers and nails were chose because of their unnatural yet standard shapes. We anticipated that more nails might be found than washers since they were slightly larger and

thus more easily seen. Sixty of the washers were painted buff or off-white; the remaining washers were painted a matte black. Similarly, 58 of the nails were buff, while 37 were black. Black and buff lie at both extremes of the continuum of colors of the artifacts we were recording in the field. We expected that more black "pseudofacts" might be discovered than buff since the surface sediments of Unit 24 were very light in color.

The garden in which we planted these artifacts was an unspectacular unit, Unit 24, with a gentle rise to the south and an arroyo bounding it on the north. Vegetation was not thick but there existed marked variation in its density throughout the unit, being less dense in the western half and more dense in the east. Sediments were light colored and consolidated so that no telltale footprints were left by the seeding crew.

These modern artifacts were "planted" throughout the unit in nine different kinds of distributions. Eight artifact clusters, of varying density, type, and color composition were constructed as described in Table 8-2. These represent our attempt to simulate "sites". In addition, 50 artifacts were placed throughout the unit to simulate "isolated occurrences" of artifacts. All of these latter were point-provenienced with the EDM and the boundaries of each cluster were recorded. Figure 8-1 shows the distribution of the seeded artifacts.

Two days after the seeding, during which time the weather remained sunny, the discovery crew swept through the unit flagging both prehistoric and modern artifacts. In this discourse, we are concerned with the latter although it should be noted that, according to the discovery crew chief, many of the prehistoric artifacts found were discovered only because the survey crew was looking intently for the planted artifacts. The analysis crew then arrived and red-flagged more artifacts while coding artifact attributes.

A total of 133, or 66%, of the seeded artifacts were rediscovered through this flagging process. Seventy-three percent of the black washers, 67% of the black nails, 65% of the buff washers and 56% of the buff nails were found. Table 8-2 breaks down the percent of artifacts recovered by various attributes of the artifacts. Color and type have a small effect on artifact recovery although relatively more black artifacts were recovered than buff. This was expected since the black stands out starkly on light sand. In addition, slightly more washers than nails were discovered. We had anticipated that the more elongate nails might be more easily recovered than the smaller washers. It seems, however, that since their surface areas are approximately the same, it is the degree of oddness in artifact shape that may make the washers more easily seen. That is, the very round washer may become more visible than the oblong nail.

Most disturbing is the percentage of isolated artifacts not discovered. Only 11, or 22%, of the isolates were recovered, while 122, or 80%, of the clustered artifacts were discovered. Considering just the clusters, it becomes obvious that the density of the artifact distribution is positively related to the percentage of the artifacts recovered for that cluster. Figure 8-2 shows that as cluster density increases, so does the percent of artifacts recovered. We had hoped that with a 5-meter transect interval, a higher percentage of the isolates might be discovered. It seems thus that searching intensity is related to expected payoff. That is, we are

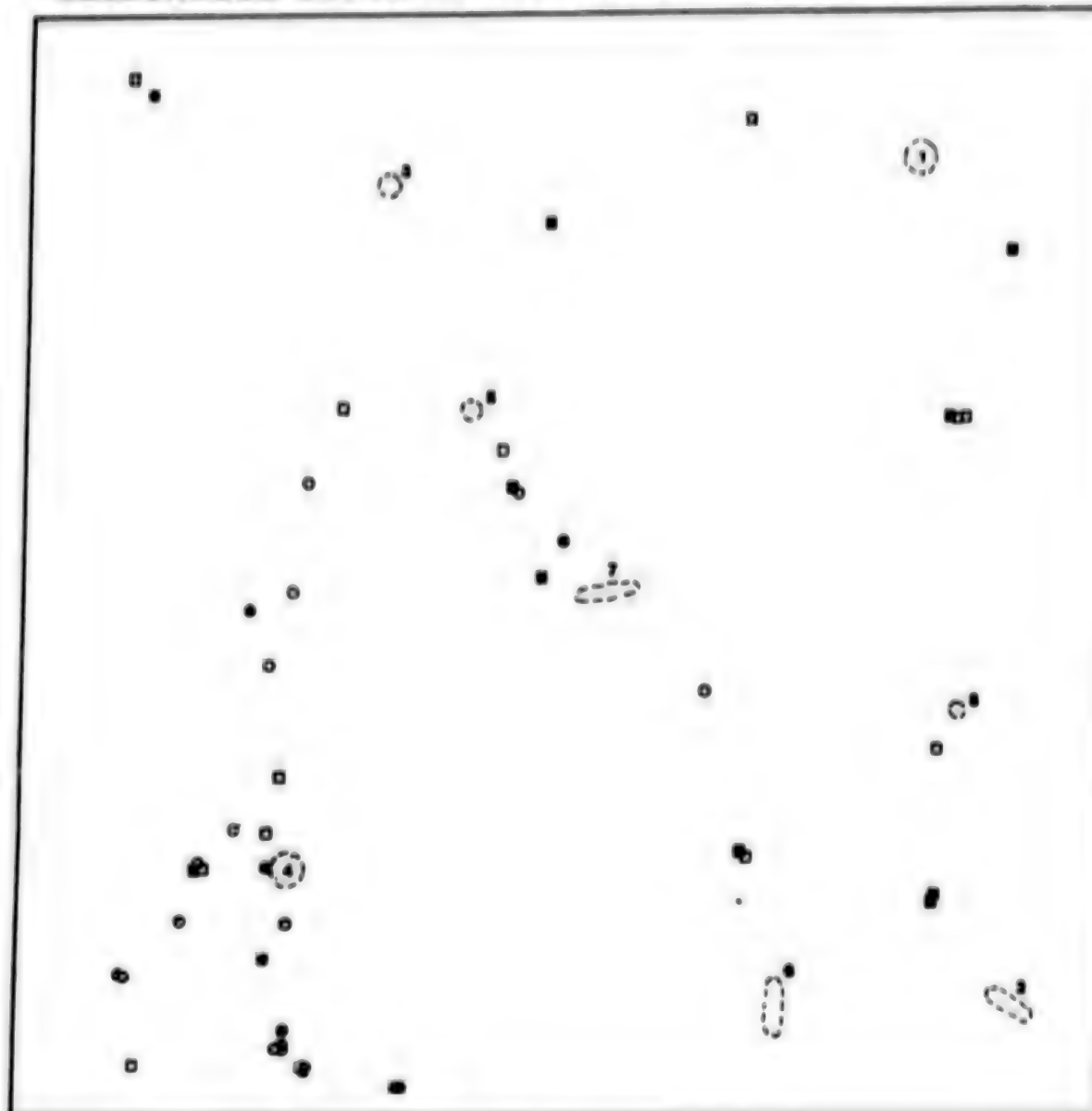
BLANK

PAGE

Table 8-2. Cluster Descriptions

Cluster	Name	TYPE		COLOR		Total	Area (sq. m.)	Density
		Washers	Nails	Buff	Black			
1	Buff	10	10	20	0	20	314	.064
2	Black	11	9	0	20	20	40	.500
3	Little Mixed	11	7	9	9	18	20	.900
4	Nail	0	10	5	5	10	314	.032
5	Washer	11	0	5	6	11	78	.141
6	Big Mixed	10	9	9	10	19	40	.475
7	Big Buff	10	20	30	0	30	40	.750
8	Big Black	20	4	0	24	24	28	.848

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



BLACK ■

BUFF □

0 100 200
METERS

WASHER ○

NAIL □

Unit 24 Seeded Artifacts

Figure 8-1. Unit 24 Seeded Artifacts.

BLANK

PAGE

Table 8-3. Percent of Artifacts Found and Not Found by Attribute

	C O L O R		T Y P E		P R O X I M I T Y	
	Buff	Black	Washer	Nail	Clustered	Isolate
F O U N D	60%	71%	70%	61%	80%	22%
N O T F O U N D	40%	29%	30%	39%	20%	78%

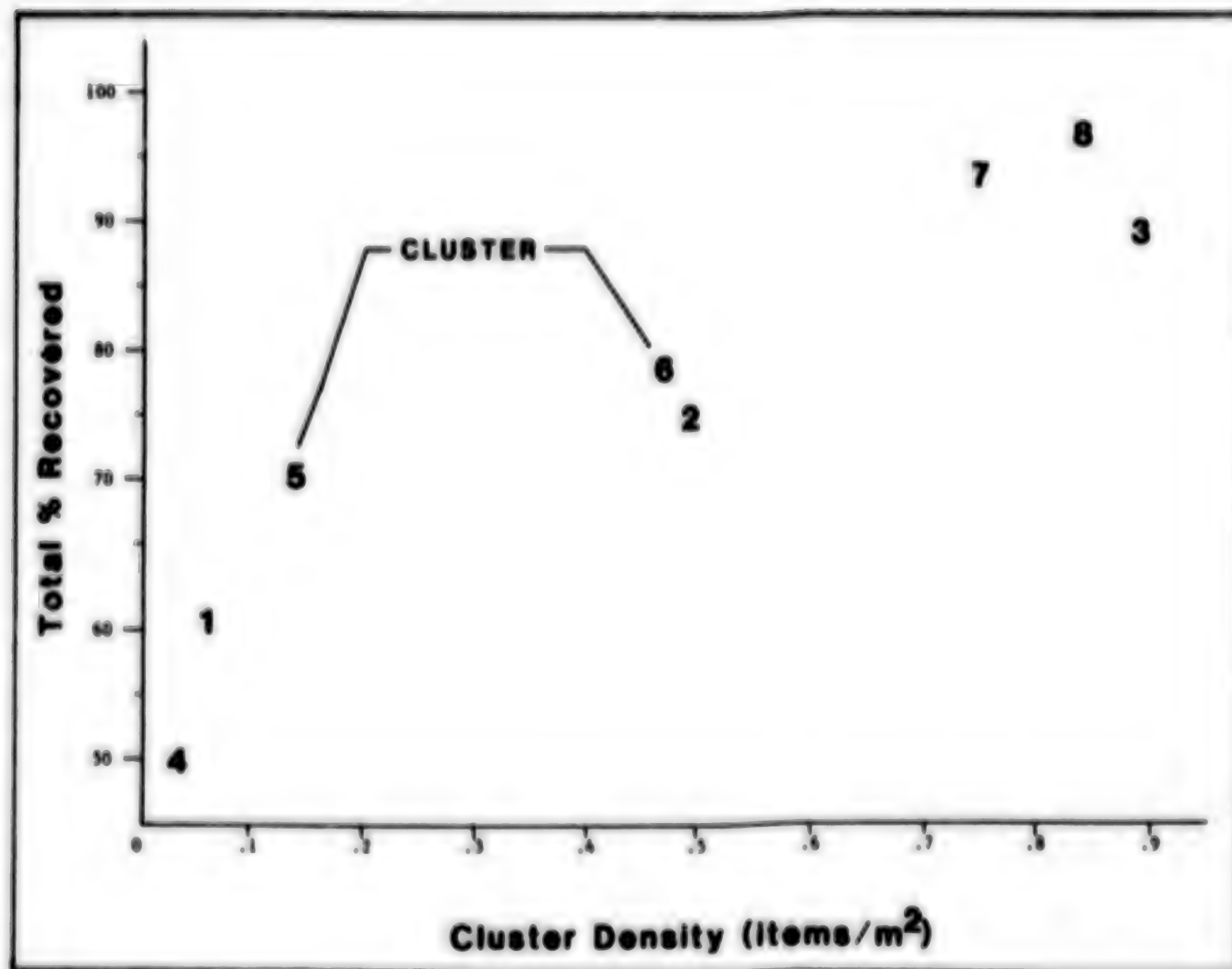


Figure 8-2. Cluster Density versus Percentage of Artifacts Recovered.

programmed to look hard for artifacts in the near vicinity of any artifact we happen to see and decrease the intensity of search as artifacts become scarcer.

Examining who was responsible for finding what, it is clear, not surprisingly, that the discovery crew found most (111 or 55%) of the seeded artifacts while the follow-up analysis crew found an additional 10%. Table 8-4 shows that the discovery crew recovered almost equal percentages of black vs. buff artifacts, while the analysis crew found 3 times as many black as buff artifacts. The discovery crew also found slightly more washers than nails while the analysis crew found approximately equal shares of each. In terms of clustered vs. isolated artifacts, no clear pattern emerges. The discovery crew found a percentage of clustered artifacts more than 4 times that of isolated artifacts. Meanwhile, the analysis crew, who would be spending most of their time in the vicinity of the clusters, found in those clusters 2 times that percentage found in isolated occurrences. This is likely due to the fact that the discovery crew had already flagged most of the clustered artifacts leaving few to be picked up by the analysis crew. Figure 8-3 shows that in general, as cluster density increases, so does percent recovered by the discovery crew. When those artifacts found by the analysis crew are added, this relationship between artifact density and probability of discovery, if you will, is strengthened.

To summarize these results, it seems that an artifact in the near vicinity of another artifact has a much greater chance of being found than an isolated artifact. Dark color and an unnatural shape seem to enhance its chance of being discovered. The tenor of these results is certainly expectable, but the magnitude of the difference between percents recovered in clustered vs. isolated scatters is disquieting.

Suggestions for Increasing Discovery Accuracy and Precision

Two possibilities suggest themselves as ways to increase survey accuracy. These include surveying a unit twice and instituting a bounty system. By decreasing unit area from 250,000 sq. meters to 122,500 sq. meters (a 350 meter x 350 meter unit), the unit could be walked once north-south and then again east-west. Half as much space would be covered in the same amount of time and the recovery rate of artifacts, no doubt, would rise.

The second suggestion involves implementing an artifact bounty system reminiscent of the days of Sir Flinders Petrie. Such a system might operate as follows. Each discovery crew member would maintain one unique flag color. Thus, it would always be possible to know who had flagged what. Bounties would be paid on items flagged that were actually determined to be artifacts by the analysis crew. Bounties could even be prorated based on proximity to other artifacts. That is, discovery of isolated artifacts might be awarded a higher bounty than the discovery of more clustered artifacts. Of course, penalties would be incurred for flagging freshly broken artifacts or non-cultural items.

Precision was not specifically addressed in this paper but clearly an accurate, imprecise instrument is just as undesirable as an inaccurate instrument. Precision of a survey methodology can be measured through repeated survey of the same unit. Alternatively, it could be easily assessed in the course of a random-seeding program in which variability in

BLANK

PAGE

Table 8-4. Percent Artifact Recovery by Crew

C R E W				
A T T R I B U T E	Discovery	Analysis	T O T A L	
C O L O R	Buff	56%	5%	61%
	Black	54%	17%	71%
T Y P E	Washer	60%	10%	70%
	Nail	49%	11%	60%
P R O X I M I T Y	Clustered	68%	12%	80%
	Isolated	16%	6%	22%

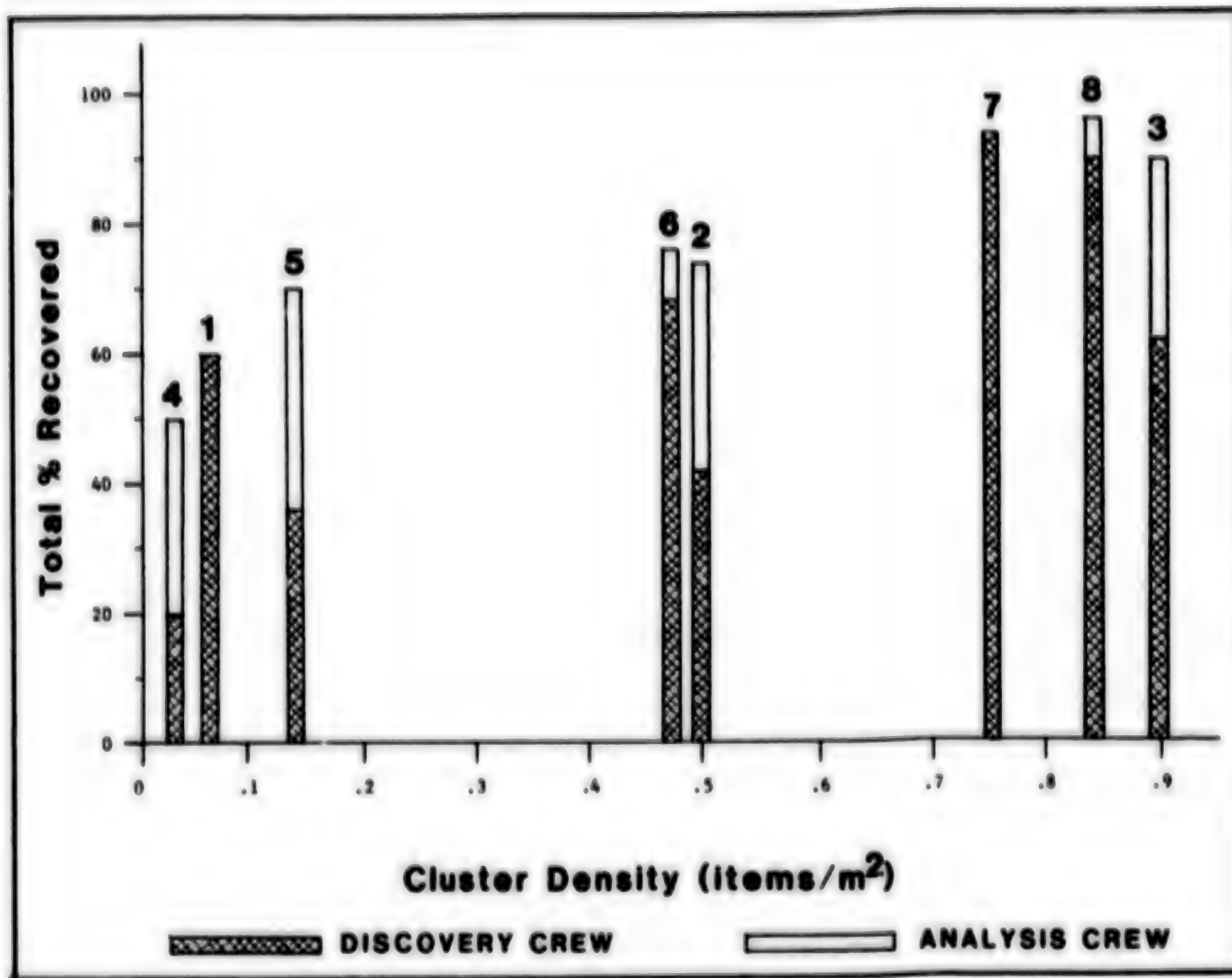


Figure 8-3. Cluster Density versus Percentage of Artifacts Recovered by Crew.

modern artifact recovery is evaluated.

Concluding Remarks

Above, we described the results of a seeding experiment in which the accuracy of the survey discovery procedure was evaluated. Wandsnider and Ebert (1983b) report essentially the same results. It should be clear from the above discussion that the accuracy of our discovery procedure varied and that some of this variance is attributable to the character of the artifact distributions. Given the self-conscious care with which we conducted this survey and given the enlightening (if not frightening) results of this experiment, we are prompted to question the results of other surveys. Are survey results a reflection of the potential surface archeology or do they better reflect how archeologists do archeology?

LITHIC ATTRIBUTE CODING CONSISTENCY TEST

A consistency test was carried out in the months following fieldwork. The test consisted of having the three principal Seedsakadee coders independently record the same lithic assemblage and is reported on by Larralde (1984). This test addresses the question of precision in data recording. Precision deals with replicability of results. Replicability is rooted in the degree to which attribute codes are clearly defined and mutually exclusive, and to the presence of an independent measuring tool such as calipers or a metric scale. Precision does not deal with the fineness or grossness of the measurements themselves, only with the reliability of the measurers in applying previously specified parameters.

Test Methodology

A lithic assemblage was manufactured by Albuquerque flintknappers Jack Bertram and Tim Kearns, using materials obtained locally and in southeastern New Mexico. Unfortunately, the gross differences in material types between this assemblage and the lithic materials found in southwest Wyoming render the results of the variable "material" irrelevant to the Seedsakadee data. In other respects, the 200 items in the experimental assemblage were selected to represent artifacts and attributes commonly found during fieldwork. Non-cultural items were included. The assemblage was presented to the coders with forms, directions to code the same way as during fieldwork, and a warning about the exotic lithic materials and the possible inclusion of non-artifacts. Comments, suggestions, and complaints were solicited. All three coders spent approximately 8 to 8 1/2 hours in coding the 200 items.

Scheduling problems caused a delay of nearly three and a half months between the inception of the test project and the completion of the test by the last coder. This delay led to skews in test results, mainly due to difficulties in remembering the coding conventions. Results of the test were input along with the field lithic data and are on computer tape. Statistical Analysis System (SAS) procedures were used to compile the results presented below.

Results

Table 8-5 summarizes analysis of variance Tukey means test results for the continuous variables. Discrepancies between Coder 3 and Coders 1 and 2 in

Table 8-5. Continuous Variable Results - Analysis of Variance of Tukey Means Test

<u>Variable</u>	<u>Coder Comparison</u>	<u>Lower Confidence Limit</u>	<u>Difference in Means</u>	<u>Upper Confidence Limit</u>
Length (in mm) n=134	1 - 2	-0.8	0.2	1.3
	1 - 3	2.2	3.1	4.3*
	2 - 3	2.0	3.0	4.1*
Thickness (in mm)	1 - 2	0.6	1.0	1.5*
	1 - 3	0.4	0.8	1.2*
	2 - 3	-0.1	0.3	0.7
Dorsal Scar Count n=134	1 - 2	-0.2	0.1	0.5
	1 - 3	0.0	0.3	0.6*
	2 - 3	0.1	0.2	0.5

* Comparisons significant at the .05 level.

measurement of length stem from Coder 3 using a different measuring technique, i.e., length measured perpendicular to platform vs. length measured along the longest axis. Thickness discrepancies stem from use of a different measuring technique by Coder 1: estimation to the nearest millimeter using the metric scale rather than measurement using calipers. Still, confidence intervals for Coder 1 are within .5 mm of the mean, even though they surpass the .05 level of significance. Dorsal scar results show an actual difference of plus or minus one scar. Coder 1 consistently inflated the number of scars, while Coder 3 consistently deflated the scar count. Table 8-6 presents coder idiosyncrasies in recording number of dorsal scars and in recording the ordinal variables.

Ordinal variables represent gross breakdowns of continuous measurement. Cortical cover, for example, was measured in four intervals, while a slightly finer six-interval scale was used for measurement of total edge modification and total surface modification. Tables 8-7 and 8-8 summarize results of the ordinal and discrete variable tests. For the ordinal test, Coder 1 again tends to inflate estimates, while Coder 2 deflates the six interval scale estimates.

Large discrepancies occur in all the five discrete variables. The variable "type" differs from the other variables in that decisions about several attributes are necessary in order to "type" an item. The 18 codes for the variable "type" are nested in seven clusters, so that a coder might agree that an item is a flake, but disagree as to what kind of flake it is. There is a 22.9% vs. 10.2% difference in mean total disagreement vs. mean within-cluster disagreement. Nineteen of the total of 88 disagreeing calls (21.6%) involve discrepancies in whether an item is a flake fragment or angular debris.

For other variables, per cent of disagreement ranges from 4% to 42%. Per cent of surface modification has the highest overall rate of disagreement, and breakage has the lowest overall rate of disagreement.

Discussion and Recommendations

Test results indicate levels of coder discrepancy on all variables well above the .05 significance level usually accepted by statisticians. Three avenues of action can be considered. These deal with coder-specific patterns, with variable-specific problems, and with confidence limits.

Tables 8-6 and 8-9 identify coder-specific patterns in a preliminary way. Cluster analysis may be used to confirm and enhance this patterning. The patterns should then be compared to sample unit data to determine whether similar patterns can be found there. If so, the data can be manipulated to minimize coder-related error.

The problem with the discrete variables seems to be one of imprecise definitions of attribute states. As discussed above, types are composites of attributes and a combination of decisions is required to "type" an object. The amount of precision in typological classification depends on the precision and cohesiveness of these individual decisions. Here, it is clear that the "within cluster" definitions are so vague as to be easily misconstrued. The definitions may be honed, or differences between within-cluster types may be re-evaluated. Perhaps some of these types can be

Table 8-6. Ratios of High to Low Coder Disagreements on Continuous and Ordinal Variables

VARIABLE	CODER		
	1	2	3
Dorsal Scar	27:10	12:13	10:17
Completeness*	10:16:1	13: 7:1	8: 6:32
Cortical Cover	6: 4	14:14	2:12
% Edge Modification	5: 3	1: 6	0: 4
% Surface Modification	6: 2	1: 5	3: 1

* high:low:not applicable/indeterminate

Table 8-7. Percent Disagreement in Coding of Ordinal Variables

VARIABLE	n Mean %		CODER					
			1		2		3	
	n	Mean %	n	%	n	%	n	%
Completeness	177	19.4	32	18.1	22	12.4	49	27.7
Cortical covering	173	10.2	10	5.8	28	16.2	15	8.7
% Edge modification	27	28.4	8	29.6	8	29.6	7	25.9
% Surface modification	24	34.7	10	41.7	8	33.3	7	29.2

Table 8-8. Percent Disagreement in Coding of Discrete Variables

VARIABLE	n	Mean %	CODER					
			1		2		3	
	n	Mean %	n	%	n	%	n	%
Type								
Expanded	130	22.9	48	25.4	41	21.7	41	21.7
Collapsed	58	10.2	15	7.9	18	9.5	25	13.5
Platform	83	20.5	12	14.5	19	22.9	20	24.1
Breakage	25	9.3	4	16.0	2	8.0	1	4.0

Table 8-9. Frequency and Percentage of Collapsed Types in Assemblage

TYPE	1		CODER 2		3	
	n	%	n	%	n	%
Core	7	8.0	2	2.3	6	6.8
Angular Debris	3	3.4	5	5.7	20	22.7
Flake	59	67.1	56	63.6	47	53.4
Chunk	0	0.0	3	3.4	3	3.4
Uniface	6	6.8	10	11.4	1	1.1
Biface	9	10.2	12	13.6	10	11.4
Other	0	0.0	0	0.0	1	1.1
Not an Artifact	4	4.6	0	0.0	0	0.0

n=88

eliminated with no analytical loss. Another option is to do away with the within-cluster types completely, and use other attribute data (eg., platform, length, thickness) to define them.

An increase in the number of ordinal variable intervals to choose from leads to a decrease in precision. Here, the six-interval scale used for measuring surface and edge modification yields 31.6% mean disagreement compared to 10.2% for the four-interval scale used to measure cortex cover. Vagueness in estimating the missing part of an item is probably responsible for the higher 19.4% mean disagreement rate on completeness, which was measured with a three-interval scale.

For the continuous variables, confidence intervals quantify observation error. Standard statistical significance levels may provide guidelines for confidence interval acceptability. In the absence of knowledge about the behavioral meaning of the variables, however, the meaning of the confidence intervals and significance levels becomes difficult to assess. How precise is precise enough? Independent methods of assessment are needed: Questions of behavioral meaning can be addressed through experimental lithics studies or through related research that speaks to the topic of accuracy.

In conclusion, if utility is measured in terms of what was learned about the data, the test must be judged a success. Although it would have been "nice" to have achieved 100% agreement among the three coders on all variables, the test sets realistic parameters for data manipulation.

V. PRELIMINARY ANALYSES

In this section, we present the results of some initial explorations of the potential of the Seedskadee data base. While the preliminary nature of these studies cannot be over-emphasized, they nevertheless demonstrate the richness and versatility of the data base. We would like to stress the fact that many of the questions addressed below could not even be broached with a less flexible, site-oriented data base. The first study addresses the problem of surveyor bias in the discovery of artifacts, using discovery form data from all units. An unrelated, yet pertinent problem is the design of spatial analytic methods consistent with the structure of the data and aligned with the larger questions archeologists ask about prehistoric adaptation. These two research problems are entertained in the following pages.

SOURCES OF DISCOVERY BIAS

The discovery form data are amenable to additional analyses that may aid in pinpointing sources of bias. While the seeding experiment described in Section IV measures the degree of survey accuracy, these discovery form analyses can help in identifying factors underlying the seeding experiment results. Examples of factors that may be responsible for discovery bias are enumerated in Section IV. They include environmental conditions (eg., lighting and weather), personal conditions (eg., amount of survey experience and day-to-day health), and crew conditions (eg., sweep time). In this section, the effects of time of day on number of artifacts found will be discussed, and the frequency of items found on the initial discovery survey will be compared to the frequency found during later activities--gridding, mapping, and analysis. Recommendations for similar kinds of analyses are made.

Bias and Time of Day

To examine the effect of time of day on number of artifacts discovered, the day was divided into three parts, morning (starting time to 11:00 am), mid-day (11:00 am to 2:00 pm), and afternoon (2:00 pm to quitting time). The mean number of artifacts per sweep was calculated in two ways, first for all units and secondly for only units with an artifact total of more than 75. Results are presented in Table 8-10.

Although the morning mean is lower in both cases, the difference seems to be negligible. The survey was conducted during the longest daylight hours of the year, with sunrise at approximately 5:30 am and sunset at approximately 9:00 pm, which suggests that during actual discovery hours, variability in angle of light was not extreme enough to influence artifact visibility. One would expect other factors which correlate with time and which probably also influence recovery rates, for example, temperature, to skew these results. We do not have accurate temperature records or weather records per sweep. However, no crew days were lost due to bad weather and most days were clear and sunny. Results suggest that either time of day and temperature/weather are not significant in artifact discovery on this project, or that mid-day and afternoon brightness, reflectivity and heat balance morning sun angle in their influence on recovery rates for a net result of no difference.

Table 8-10. Frequency of Artifacts per Sweep by Time of Discovery

	ALL UNITS			UNITS WITH 75+ ARTIFACTS		
	<u>Sweeps</u>	<u>Mean</u>	<u>S. D.</u>	<u>Sweeps</u>	<u>Mean</u>	<u>S. D.</u>
Morning	137	.04	.07	100	.04	.05
Mid-day	251	.05	.09	186	.05	.08
Afternoon	94	.06	.08	79	.05	.08

In northern dry temperate regions like Wyoming, where seasonal differences are extreme, we would expect extreme seasonal differences in test results, with increasing mid-day recovery rates and decreasing morning and afternoon rates as temperature and sun angle drop seasonally.

Discovery Rates: Discovery Crew vs. Other Crews

In order to look for patterning in discovery contexts, we compared the frequency of orange flags placed during the 5-meter interval survey with the frequency of red flags placed during mapping and recording operations. Red flags indicate artifacts or features not found during survey, but found afterwards. The large majority of red flags was placed by the recording crew. We considered that a long time lag between discovery crew and mapping and recording crew operations might increase the red flag count because of changes in the surface in the interim period; these changes might expose items previously hidden. Table 8-11 is a summary of discovery context comparisons as shown by flag color. It also includes the time lag in days between unit survey by the discovery crew and unit completion by the recording and mapping crews. On this table, units are ranked in order of the orange-to-red flag ratio, from highest frequency of orange flags to lowest.

It should be recognized that two units are exceptional, partially because of their distributions and partially because the procedures applied to them are different from those applied to other units. These are Unit 16 and Unit 28. On Unit 16, the red flag count is deflated because 1) large clusters of firecracked rock were recorded as features rather than by recording each piece of rock as an individually red-flagged item; and 2) the mapping was done prior to artifact recording. This may have discouraged searching for more artifacts because an additional trip to the unit by the mapping crew would have been necessary to record them. Unit 28 is different because the discovery crew virtually crawled over the unit in an attempt to recover as many items as possible, rather than returning to concentrations after the survey to red-flag items. This resulted in an orange flag rate of more than twice that of any unit with a comparable number of artifacts. It is probably also no coincidence that Unit 28 has the highest artifact frequency of any unit on the survey.

With these two exceptions, two trends are evident from the Table 5.2 data: the first is that the time lag seems to make no difference in discovery of additional items. Some of the highest orange-to-red flag ratios occur on units with the longest time lags between discovery and mapping/recording (eg., Units 9 and 12), as well as on units with the shortest time lags (eg., Units 13 and 24).

The second point is that artifact frequency is correlated with orange flag ratio but not in a linear fashion. The correlation is strongly influenced by the degree of artifact clustering. When plotted, this results in a well-defined curved line with clusters of units representing high (1000+ items), medium (100 to 300 items), and low (1 to 99 items) artifact density at the ends and midpoint of the curve. There is a curious gap in artifact frequency at between 300 and 1000 items.

High density units (all of which had gridded concentrations) have low orange-to-red flag ratios. Middle density units (with both gridded and ungridded

Table 8-11. Discovery Context as shown by Flag Color*

<u>Unit #</u>	<u>Total Items in Unit</u>	<u>Ratio of Orange to Red Flags</u>	<u>Time lag in days between Survey and Completion</u>
13	5	No red flags	2
14	4	No red flags	8
16	156	51.0	2
9	74	17.5	38
24	24	11.0	2
12	117	10.7	15
28	1664	3.91	10
22	315	2.29	3
6	373	2.24	5
26	338	2.02	6
23	166	1.55	3
4	1336	1.39	14
21	136	1.19	3
2	341	1.09	1
15	403	1.05	9
17	354	1.05	4
8	1441	1.04	11
10	1075	0.96	5
20	509	0.85	5
25	1249	0.83	13
19	1320	0.72	4

* A ratio of 1.0 would indicate an equal number of orange and red flags, while ratios less than 1.0 indicate more red flags than orange. Units are ranked by ratio, from highest to lowest.

concentrations) which have clustered distributions have slightly higher ratios. Low density units have high ratios. In other words, the more items there are and the more these items are clustered, the higher the number of red flags. This is exactly the pattern we would expect, given the outcome of the seeding experiment as discussed in Section IV: Archeologists tend to look harder in places where items have already been found. Of course, the red flag procedure, which emphasized artifact concentrations, formalized this tendency, just as site-oriented survey formalizes it. In contrast, on low density and dispersed distribution units, the mapping and recording crews tended to look for flags, not artifacts. On two units, distribution was so sparse that the mapping crew rather than the recording crew recorded the artifacts, which further decreased the chance of finding more.

Most importantly, results of these flag color comparisons suggest that even at 5-meter intervals, unless a concentrated effort is made to slow sweep time enough to find all artifacts, 50% or more may be missed during preliminary survey. The 50% that is found will have an unduly large influence on our impression of the artifact distribution in a unit. The seeding experiment strongly indicates that surveyors look for clusters even when finding them is not a part of the survey methodology. Table 5.2 further indicates that the practice of unsystematically emphasizing concentrations, as in site-oriented survey, ensures that spatial distributions are skewed in favor of clusters of items. We agree with Nance (1981) that clustered distributions are "real", but given standard survey methodology, it is difficult to assess how accurately we are seeing the cultural landscape.

These preliminary analyses represent only a portion of the work that could be done with the data in its present format. Other possibilities include comparisons of artifact frequencies per sweep with sweep time, and comparisons of artifact counts per sweep per crew member over several units to ascertain whether there are significant differences in discovery rates among individuals. The list of possibilities could undoubtedly be expanded.

Future fieldwork should incorporate a fine-tuned monitoring of the discovery context: high quality thermometers for measuring sweep-by-sweep temperature, better weather records, and interval scales for measuring other hazards and distractions such as insects should be employed. The potential of these simple measurements for helping archeologists to understand methodological bias is great, and we would like to see these kinds of data collected on other surveys in a variety of locales, seasons, and conditions.

SPATIAL ANALYSIS FEASIBILITY STUDY

Many of the spatial studies conducted by archeologists are geared towards discovering activity areas or, more realistically, depositional sets which represent the confounding of cultural and acultural processes. The attempts by archeologists are briefly reviewed below in terms of their goals and the attainment of the specified goals. After this critique, we present a nested spatial analysis procedure detailing its goals and the equipment required for its execution. At the same time, we report on the progress of the implementation of such a method on the prehistoric artifacts in the Seedskadee Project area given the resources available to us at this time.

Spatial Analysis in Archeology

Spatial analysis in archeology is a recent and still developing phenomenon. The goals of such analyses are to reconstruct from locational information about artifacts isolated behaviors of prehistoric humans usually at just one site. Three different authors and/or institutions are currently responsible for the strides taken in this neophytic field and their work is reviewed below in no particular order.

Robert Whallon of the University of Michigan has been engaged in spatial analysis for the last decade or so and during this time his work has markedly evolved. His most recent work (in press), presents a method for identifying within a site those areas with similar assemblages. The method consists of 1) constructing density maps for each artifact type, 2) calculating the relative proportion each artifact type contributes to the assemblage at different points across the site, 3) clustering these proportion vectors so that similar assemblages are identified, 4) mapping the cluster members and examining their distribution, and 5) reconstructing the activities which occurred at a site in light of spatial patterns and ethnoarcheological knowledge. He demonstrates this analysis sequence on the Eskimo Mask site recorded by Binford (1978). Carr's (1981) criticism of this technique is that it ignores the actual spatial relationship between artifacts and that the remains of overlapping activities cannot be decomposed.

Carr (1981, in press) proposes the implementation of several techniques which he contends circumvent the deficiencies of Whallon's analytic method. Carr's method considers the distribution of each artifact type within a site. Using spatial filtering, Fourier analysis, spectral analysis, and histogram equalization, each of which he discusses in detail, Carr suggests that the scales of spatial patterning can be discovered within sites and portions of sites. In unexplained ways, these different scales of artifact patterns can thus be linked with prehistoric human activities. His technique does not deal with the interaction of artifacts although presumably artifacts occurring in patterns with similar scales could be subjected to further analysis. Additionally, the application of the suggested techniques assumes that archeologists already know the scales of human activities. This is, however, at least some of what we are trying to learn about and perhaps Carr's techniques, which have yet to be applied to archeological data, could serve as a learning tool.

The last group of analysts working on the spatial organization of archeological remains comes from the University of Pennsylvania (Kintigh and Ammerman 1982, Simak and Larick 1983). These archeologists have developed and implemented a clustering algorithm which operates on the proximity of artifacts of one type. It thus identifies various numbers of spatial clusters and leaves it to the archeologist to choose which clustering of the artifacts is "best" in light of subjective information about site formation processes, etc. The major advantage of the technique is that it is interactive and so the archeologist participates in finding the best spatial cluster solution. Note, however, that the spatial clusters corresponding to different artifact types must then be "stacked" one atop the other so that a composite analysis of assemblage distributions can proceed.

All three of the techniques reviewed above represent the culmination of a decade of thinking by archeologists about how to manipulate spatial information for archeological analysis. Early research in this field consisted of blindly borrowing and indifferently applying different analytic techniques developed by geographers and biologists. These more recent efforts represent the initial attempts of archeologists to design their own analyses tailored to deal with archeological data and answer archeological questions. All three methods, however, are built on the flawed foundation of site reconstruction. They all propose to find activity areas, although all of the above researchers realize that the distribution of artifacts within a site results from natural as well as cultural processes. The three methods can be criticized on another base, however, in that they each tackle only part of the spatial analytic problem. Kintigh, Ammerman, Simak, and Larick, for example, present a method for identifying spatial clusters. Carr presents methods for describing and comparing spatial organizations of artifacts. Whallon develops a method for describing and comparing assemblage content.

Clearly, what is desired is a method which allows us to unambiguously describe and compare assemblages both in terms of content and in terms of spatial organization. Such a method, multi-stepped by nature and drawing on each of the above methods, is outlined below as it might be executed on the Seedskadee data base.

1) Develop Taxonomy of Analytic Units--The unit of discovery and analysis in the Seedskadee project is the artifact. While it is true that no artifact is exactly like another, it is also true that some artifacts must be similar to others. This follows from the fact that stone can be fractured in only a couple of different ways and that people engage in some redundant behavior so that the archeologists should not find an infinite array of different chipped stone artifacts. We would therefore like to collapse the descriptions of the 11,000 artifacts into just a few descriptive categories which retain all of the information inherent to the larger body of description. The ideal way to do this is to use well established information about how rocks break and about how people use rocks. The former type of knowledge is slowly accumulating while the latter is impossible to obtain since most modern aboriginal groups no longer rely solely on stone for their tool needs. The less ideal way to effect this collapse of redundant description is through some inductive technique and this is the avenue we have chosen as detailed below. Note that such a reduction should be conducted for whole flakes and broken flakes, and for each material type. That is, in the Seedskadee case, four such reductions should take place on chert flakes, chert flake fragments, quartzite flakes, and quartzite flake fragments. Many inductive data collapsing techniques such as cluster analysis are available in computer packages such as the Statistical Analysis System (SAS) and these have been successfully applied by, for example, Whallon to summarize the information content of an assemblage.

2) Identify Spatial Units--Once these new units of analysis have been derived from the artifact descriptions, it is necessary to find the boundaries of the assemblage. Generally, spatial proximity has been used as a criterion for membership in an assemblage. We suggest that this criterion may allow for the confounding of several different assemblages. Thus, we suggest that the proximity criterion be used but that first-order

assemblages derived in such a manner be viewed with skepticism. As we shall propose below, we suggest that the simple assemblages be used to dissect the larger or more complex assemblages. To define the boundaries of these first-order assemblages, a method which allows the interaction between analyst and computer such as developed by Kintigh and Ammerman (1982; c.f. Simak and Larick 1983) seems appropriate. Such a technique takes into consideration the fact that the boundary of an assemblage not only depends on characteristics of human space use but also on natural processes which may disperse or aggregate artifacts. Thus, the archeologist must use information about topography and sediments as well as proximity to decide assemblage boundaries. The software for this interactive spatial clustering has already been developed by Kintigh and Ammerman and could presumably be adapted to local hardware.

3) Content Description and Analysis--Once artifact assemblages have been defined, the contents of these assemblages must be objectively summarized. The artifact taxonomy was developed to facilitate this description. In addition to flake contents, the presence-absence of tools, fire-cracked rock, and other features should be described. The rigorous definition and description of assemblages is a necessary precursor to searching for patterning in the contents of the assemblages. For such an analysis to proceed meaningfully, a large number of assemblages must exist so that any resident patterns can be found. The family of techniques known as Principal Components Analysis would be most appropriate for the identification and comparison of different assemblage contents. The Statistical Analysis System (SAS) computer package contains suitable analysis programs or these can easily be written in a language such as MATLAB to perform on an independent system.

4) Structural Description and Analysis--Complimentary to the above contentual analysis is that which looks to the spatial organization of artifacts within the spatial bounds of the assemblage. Such an analysis ideally requires specialized image processing equipment for manipulation and presentation for the archeologist to comprehend structural information about many different artifact groups. For example, the spectral analysis of flakes, of fire-cracked rock, of tools, or of attributes would require that many spatial cluster images be analyzed. In addition, the spatial organization of the different principal components could be evaluated. Carr (1981) presents the digital formulations for such an undertaking but leaves the question of storage and comparison of spectral images unanswered. Analog image processing software and hardware have already been developed to deal with such problems and the archeologist could benefit from this technology.

5) Pattern Dissection--The premise operating in this portion of the analysis is that larger, more complex assemblages may represent the confounding of several smaller assemblages. Thus, to learn about the larger assemblages, we suggest the smaller, less complex assemblages be "factored" out of the larger assemblages. At this point, we have not developed any criteria for deciding when the "factored" assemblage is made any more comprehensible and can only hope that such criteria will become known through trial and error manipulation of the data base.

To undertake the analysis described above would require many manhours and a dedicated computer system with image processing capabilities. Such

resources are not impossible to come by, but were inaccessible for this trial. Therefore, we have limited ourselves to a discussion of those parts of the analysis which do not require specialized equipment. As part of this trial analysis, we focused on the prehistoric remains from Unit 17.

Unit 17 was a somewhat spectacular unit straddling a mesa scarp and its adjoining pediment. Impressionistically, we recognized at least two artifact concentrations in the unit up on the mesa but these were not dense enough to necessitate gridding. In addition, many artifacts were discovered scattered throughout the Unit.

The first part of the spatial analysis consists of collapsing the flake descriptions into a manageable but meaningful number of categories. What constitutes a meaningful categorization remains open to debate. The meaning we hope to assign to the flakes in this analysis through our categorization is their position in the cultural trajectory of a piece of rock. That is, we are interested in developing a simple taxonomy which summarized the life history of chipped stone. Unfortunately, few fast and hard rules for what early vs. late reduction flakes look like exist since their disposition is dependent on the size of source rocks, the reduction goal, and other difficult-to-control factors. We do know, however, that a flake with 100% dorsal cortex is from an early reduction stage while a flake with no cortex and multiple dorsal scars is from a later stage. Similarly, Stahle and Dunn (1983) have experimentally shown that flake sizes decrease with biface reduction progress. It is unclear, however, how a short, squat primary flake differs from a long, thin primary flake. The perspective we have assumed here, in order to deal with this lack of knowledge, is to engage in inductive collapse of flake description and, in later stages of the analysis, look for similar or dissimilar behaviors of flake clusters. It would thus be possible for flake clusters which evidence the same sorts of analytic behaviors to be lumped.

The actual descriptive reduction took place on whole, non-utilized flakes from Unit 17 using PROC FASTCLUS, a SAS clustering package. The attributes used in the clustering were those which ought to be sensitive indicators of reduction stage, i.e., size, amount of cortex (V10), number of dorsal scars (V11), and type of platform (V12). Size was measured with two indices called SIZE and THIN. SIZE was calculated by multiplying length (V4) and thickness (V6; each measured in millimeters). As SIZE increases, so in general does the volume of the artifact. THIN measures degree of thinness and was calculated by dividing length by thickness. Additionally, because it was expected that material types, occurring in different sizes and perhaps being utilized for different ends, may contribute to the definition of flake clusters, V3 (material type) was included as a variable. An initial clustering attempt using these five variables produced many, many unique clusters with few members. The large variability and the continuous nature of the SIZE and THIN indices was overwhelming the very small amount of variability inherent to the ordinal scales of the other variables. To assure that the ordinal variables would contribute as much to the definition of clusters as the size variables, the continuous size indices were reduced to ordinal variables through inspection of histograms for each index (see Figures 8-4 and 8-5). When the clustering algorithm operated on this modified data base, more tightly defined clusters with more members resulted.

BLANK

PAGE

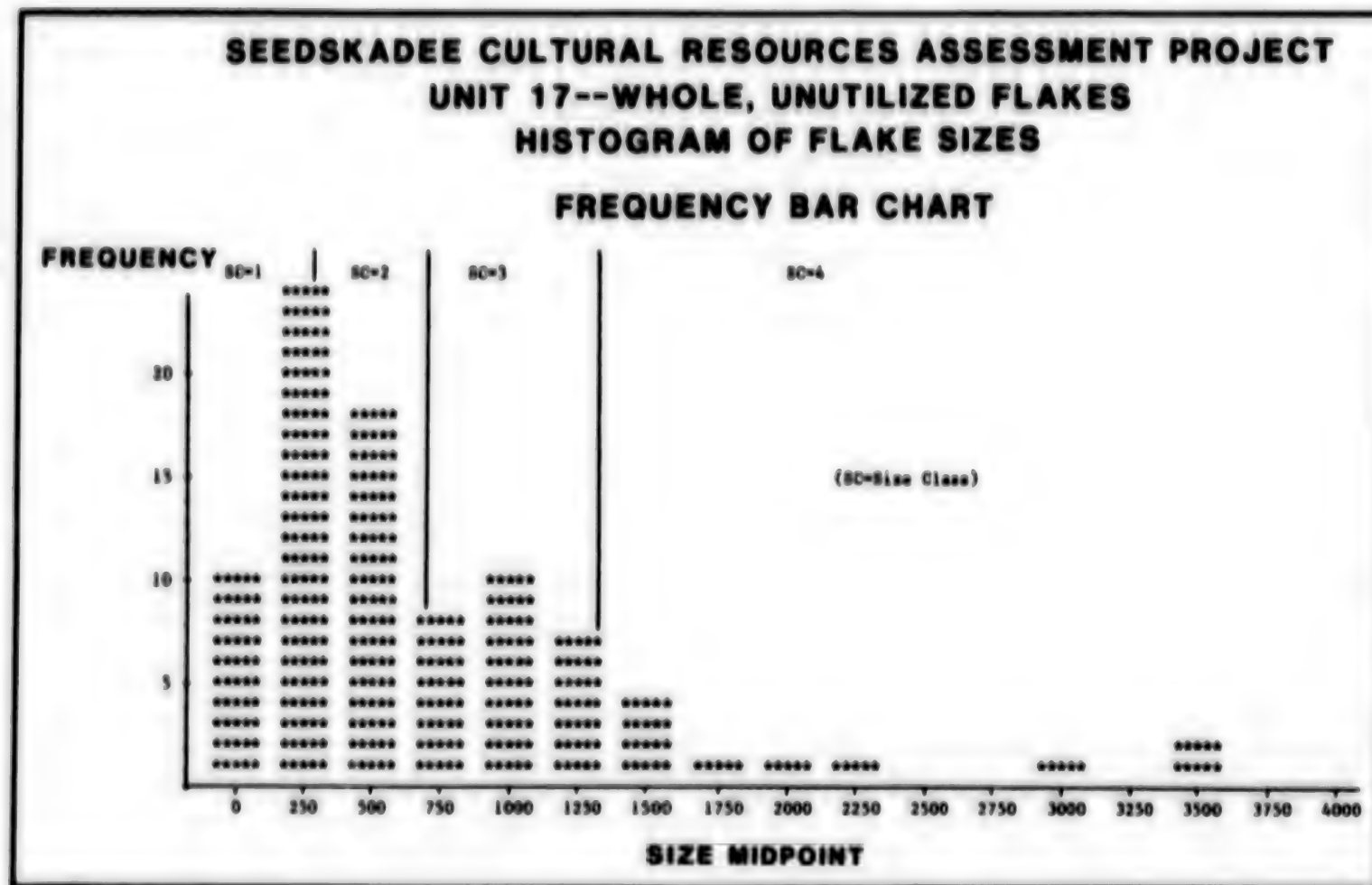


Figure 8-4. Histogram of Size Index for Whole Flakes from Unit 17.

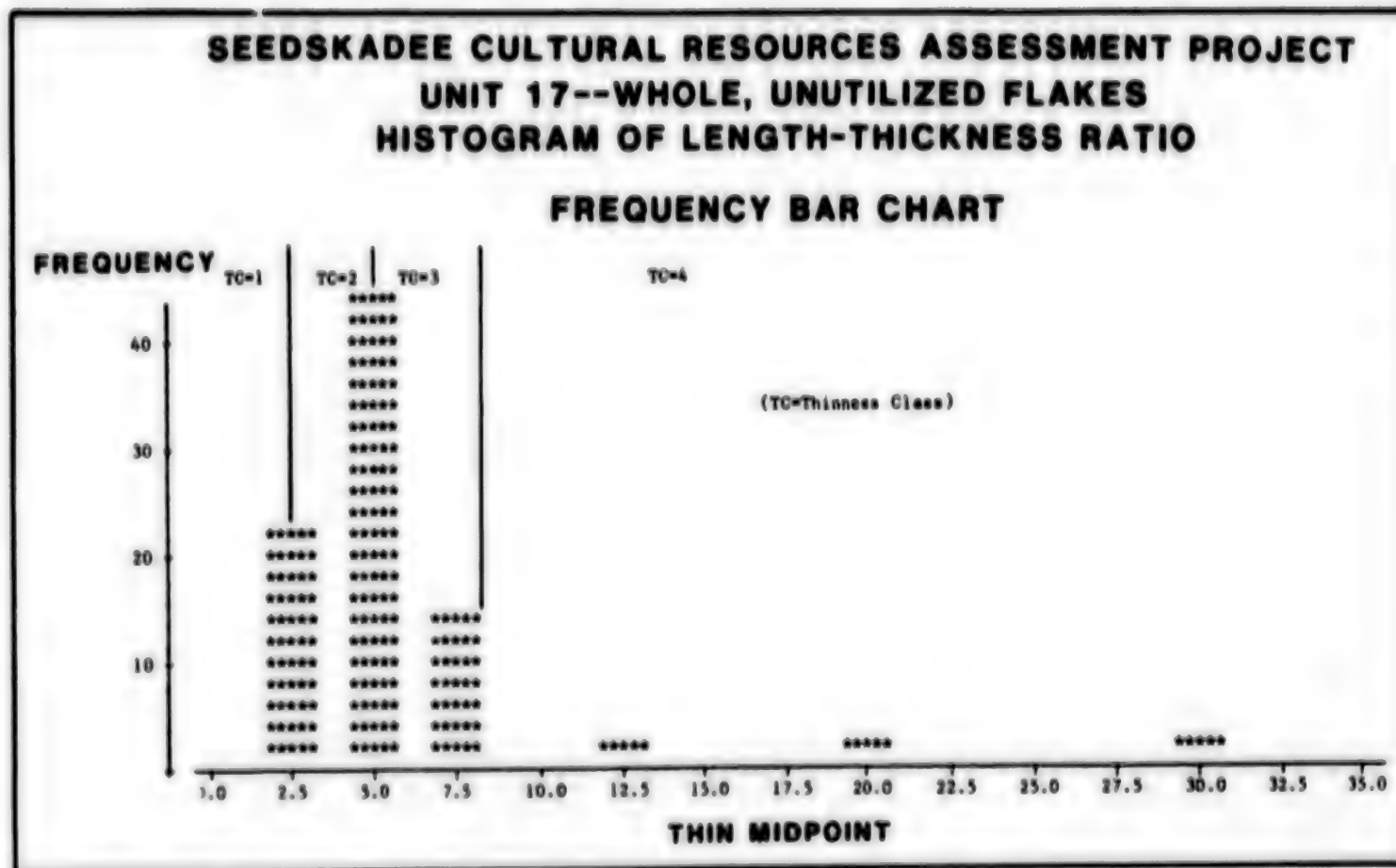


Figure 8-5. Histogram of Thinness Index for Whole Flakes from Unit 17.

The FASTCLUS procedure requires the user to specify the number of clusters to be found and provides various statistics which describe the clusters formed and the "goodness" of the clustering. Through trial and error, it was discovered that an 8 and a 14 cluster solution provided the best clustering schemes. We arbitrarily chose the 14 cluster scheme as giving a representative taxonomy of flakes. The adequacy of this scheme is indicated by the fact that the three whole bifacial thinning flakes existing in the assemblage were classified into two adjoining clusters. Appendix 11 presents the SAS descriptions of each cluster. This information is summarized in a qualitative fashion in Table 8-12.

The next portion of the analysis consists of defining assemblage boundaries through some sort of spatial clustering. We did not have the interactive clustering algorithm of Kintigh and Ammerman (1982) available to us, but we nevertheless attempted to generate a satisfactory spatial clustering scheme for Unit 17. Again, FASTCLUS, which is described as an efficient seeker of outliers, was used to find clusters given X (V37) and Y (V38) artifact locations. Between 5 and 40 clusters were sought and, by inspecting the cluster boundaries of the various cluster schemes, the 40 cluster solution seems the best solution. As Appendix 12 shows, the maximum cluster radius approaches 15 meters but most cluster radii are much smaller than this. By inspection, artifacts which seem to not be spatially associated with other artifacts are put into their own clusters. Figure 8-6 shows these spatial clusters in terms of the attribute clusters while Table 8-13 summarizes the contentual character of each cluster. Note that clusters consisting of one member have been lumped by us into a single cluster (Spatial Cluster 1).

The next stage of the analysis was to seek patterns in the spatial arrangement and content of the assemblages defined above. We do not attempt a rigorous pattern analysis here for there are too few assemblages to make the results of such an undertaking meaningful. Nevertheless, through inspection of Table 5.4, we can see patterning emerging. For example, a taxonomy of assemblages could be generated on the basis of the presence-absence of tools, of fire-cracked rock, and of flake fragments. There is some indication that flake fragments and tools are positively correlated and that this dyad is negatively correlated with fire-cracked rock. Where this relationship is not true, the size of the assemblage is quite large.

Similarly, another spatial cluster taxonomy based on the co-occurrences of various flake types could be generated. Through examination of Table 5.4, we see that types D and J (both quartzite flakes with > 50% cortex; D is small, J is large) often occur together. However, these flake types are the most frequently occurring throughout the entire unit. With a larger number of assemblages to analyze, the relationship between various flake types and other characteristics of the assemblage, such as number and kind of flake fragments, could be investigated.

The last part of the proposed analysis sequence involves the examination of the actual spatial relationships among assemblage components. We have not attempted this here for such an undertaking requires special equipment such as image processing software or hardware.

Most spatial analyses of archeological materials to date have engaged in blatant reconstructionism. We know, however, that only rarely is the

BLANK

PAGE

Table 8-12. Summary of Whole Flake Attribute Clustering for Unit 17

<u>Attribute Cluster</u>	<u>Code</u>	<u>Size</u>	<u>Thickness</u>	<u>Material</u>	<u>Amount Cortex</u>	<u>Dorsal Scar Count</u>	<u>Platform</u>	<u>Number of Members</u>	<u>Comments</u>
1	A	small	thick	chert	100%	0	non-cort. @	3	-
2	B	small	thin	chert	0%	9	non-cort.	2	BTP*
3	C	small	thick	chert	<50%	3	non-cort.	4	-
4	D	small	thick	quartzite	>50%	2	missing	18	-
5	E	small	thick	chert	<50%	2	non-cort.	2	-
6	F	small	m-thin #	quartzite	0%	3	variable	5	-
7	G	small	thin	quartzite	100%	1	variable	8	-
8	H	large	m-thin	quartzite	<50%	3	variable	7	-
9	I	small	thin	chert	0%	6	non-cort.	1	BTP*
10	J	large	thick	quartzite	>50%	1	variable	25	-
11	K	large	thick	quartzite	<50%	0	variable	3	-
12	L	medium	thin	quartzite	>50%	0	non-cort.	3	-
13	M	medium	thick	quartzite	<50%	3	non-cort.	9	-
14	N	small	thick	chert	>50%	1	cortical	4	-

@ non-cortical

* Biface thinning flake

medium-thin

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17

PLOT OF V36-V37 SYMBOL IS VALUE OF AC

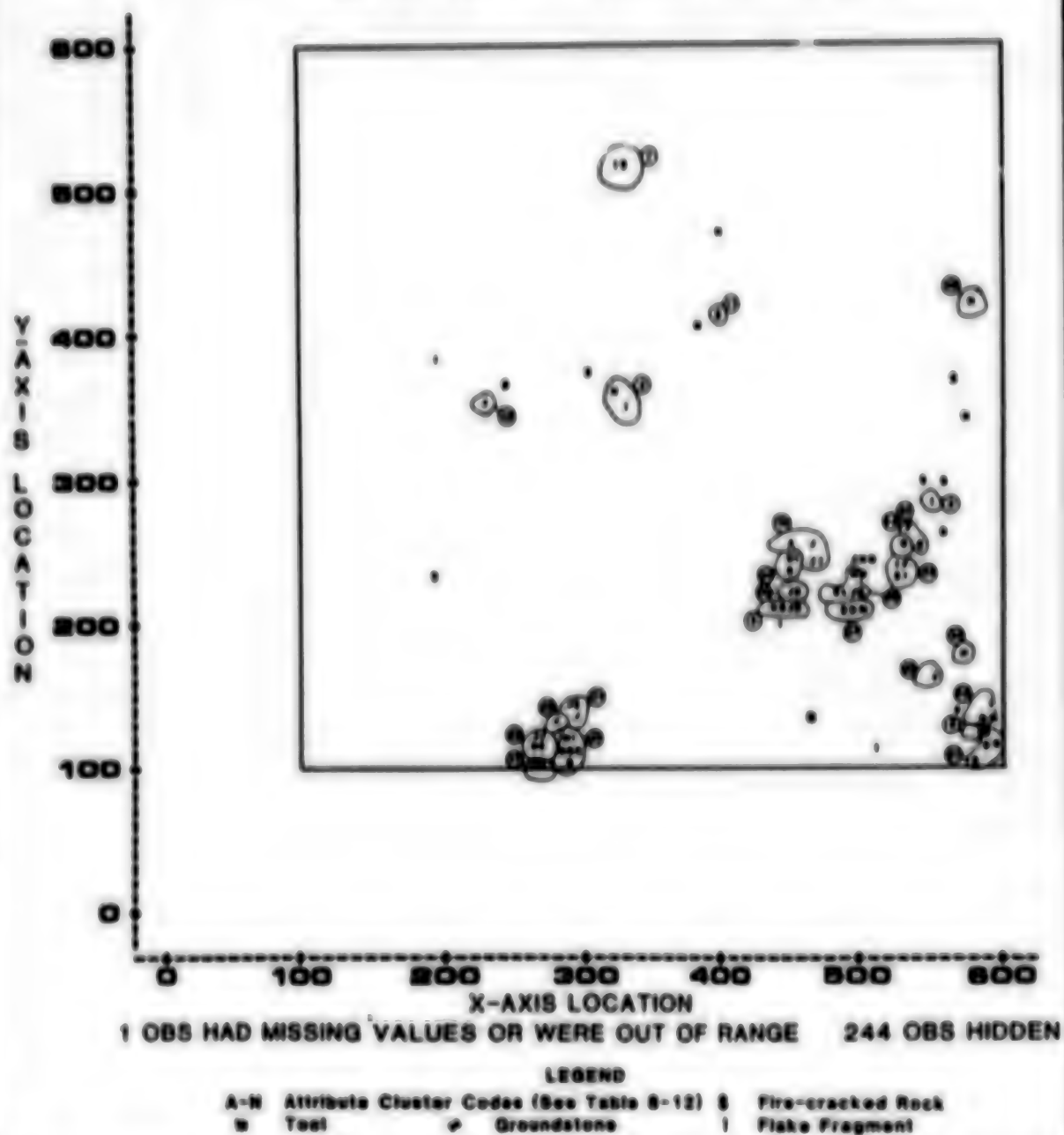


Figure 8-6. Map of Assemblages in Unit 17.

Table 8-13. Summary of Spatial Cluster Characteristics for Unit 17

<u>Spatial Cluster</u>	<u>Attribute Clusters Present</u>	<u>Tools</u>	<u>Flake Fragments</u>	<u>Fire-Cracked Rock</u>	<u>Diversity</u> *	<u>Comments</u>
1	B D F G H J M N	4	12	37	0.57	outliers
2	-	-	2	-	-	-
3	B	-	-	-	1.00	-
6	D F G H	1	35	-	0.67	3 gr. stone
7	-	-	1	4	-	-
8	D	-	2	-	1.00	-
9	D K J	2	-	10	1.00	-
10	A J M	-	5	-	0.75	-
11	H	-	1	-	1.00	-
17	D J L	-	3	18	0.75	-
18	J	-	3	-	1.00	-
21	J	1	1	-	1.00	-
22	F	1	3	1	1.00	-
23	D	1	2	-	1.00	-
24	D L	1	3	-	1.00	-
25	A C E H J L N	-	2	-	0.88	-
27	A C D E F G J M N	12	21	13	0.45	-
28	J	-	-	5	1.00	-
31	D	1	-	2	0.25	-
32	H H	-	3	-	0.67	-

* Diversity = # Attribute Clusters / # Whole Flakes

Table 8-13. Continued.

<u>Spatial Cluster</u>	<u>Attribute Clusters Present</u>	<u>Tools</u>	<u>Flake Fragments</u>	<u>Fire-Cracked Rock</u>	<u>Diversity</u> *	<u>Comments</u>
33	C D J	-	3	6	0.33	-
34	F	-	-	3	1.00	-
35	H J	-	-	-	0.67	-
36	D J	-	-	-	1.00	-
37	D H J M	-	1	19	0.80	-
38	J	-	1	9	1.00	-
39	G	-	1	6	1.00	-

*

Diversity = # Attribute Clusters / # Whole Flakes

archeological record amenable to such story making. Thus, the tack we have assumed here is to admit total ignorance about the meaning of the archeological record. We propose to search for both contentual and spatial patterns within assemblages. The above represents our initial attempt to manipulate the Seedskadee data base in a manner consistent with our nontraditional archeological method and theory. We emphasize that such an analysis could not even be contemplated without the availability of a data base with very special properties. These include a large bulk and high resolution descriptions and locations of artifacts. Only with a data base having these special qualities, like the Seedskadee data base, is the archeological analysis outlined above even permissible. And only with such analyses will we come to better understand the archeological record and what this record means in terms of prehistoric human behavior.

VI. NATIONAL REGISTER RECOMMENDATIONS

In 23 of the 25 units surveyed, prehistoric artifacts, primarily chipped stone, were found. In the remaining two units, 9 and 23, only recent and historic artifacts were recovered. No architectural remains, prehistoric, historic, or recent, were found. To evaluate the significance of the surveyed land parcels in light of National Register criteria, we turn first to the federal guidelines for nomination to the National Register of Historic Places (36CFR60). These read

The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of State and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

- (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
- (b) That are associated with the lives of persons significant in our past; or
- (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- (d) That have yielded, or may be likely to yield, information important in prehistory or history.

These regulation allow for a very flexible interpretation of the significance of historic and prehistoric sites. Most archeologist, however, make reference to a common set of site significance characteristics which lead them to nominate sites to the National Register. These characteristics include whether the site is unique, whether it is typical, whether it is large, whether it is complex, whether it has depth, whether it is very old, or whether it contributes in other ways to an understanding of the past (c.f. James, et. al., 1983). All of these significance characteristics can be subsumed under one, which is whether the site offers research potential.

Most of these site significance characteristics are relevant to surveys conducted in a traditional culture historical paradigm. The orientation of the Seedskadee Cultural Resources Assessment Project, however, is methodological rather than cultural historical. Thus, that we did not find any unique sites is at least partially attributable to the fact that we were not looking for such sites. Indeed, we are attempting to compile a library of typical sites or typical distributions of artifacts so as to search for patterning within this library. Artifact distributions in the dune units were large, dense, and no doubt have subsurface deposits, but such variability only becomes visible with reference to the small, light distributions of artifacts recovered from other units.

What the above amounts to is that we cannot recommend any of the artifact distributions found through survey to the National Register for any of the reasons commonly submitted by archeologists. Nevertheless, we feel that the research potential of all of the survey units containing prehistoric materials is high enough to warrant their nomination to the National Register. This potential stems from the contribution to the profession of archeology which the continued study of these units would yield. That is, the Seedskadee Cultural Resources Assessment Project is professedly concerned with assessing the impact of archeological methods on the archeological record. By revisiting and resurveying these units in the near future, we can begin to assess how representative the reported results of this season are in terms of the short- and long-term manifestation of archeology in this area.

We therefore recommend that all of the survey units containing prehistoric items be considered for nomination to the National Register so as to preserve these places for further investigation.

VII. RECOMMENDATIONS FOR FURTHER STUDY

The potential uses of the data accumulated through the Seedskadee Project and the various avenues of research which could be pursued are virtually limitless. Below, we make just a few suggestions for further archeological investigations using the Seedskadee data base. Most of these are methodological in the sense that they are concerned with evaluating or critiquing standard archeological field procedures.

The first and most important research problem explores the best ways to manipulate the Seedskadee data for understanding the operation of prehistoric cultural systems in southwestern Wyoming. This critical problem was addressed above in the course of discussing the preliminary analyses (Section VI), but its relevance cannot be overemphasized. The intent of the Seedskadee Project was to collect archeological data in a fashion consistent with genesis of the archeological record and in such a manner so that information about its genesis would not be destroyed. Techniques for extracting this information have yet to be developed. Obviously, it is imperative for such methods to be designed. We have demonstrated that it is feasible to collect quality information about the archeological record while working in the constrained context of contract archeology. Now it is necessary to demonstrate the utility of such a high-resolution data base for making meaningful statements about prehistoric adaptation.

A more mundane question this data base can answer concerns traditional archeological surveys. Most surveys employ a transect interval of between 15 and 200 meters. Obviously the transect interval determines to some extent both the numbers of sites recorded and the minimum size of recorded sites. The Seedskadee data base can be used to investigate the interaction between transect interval and characteristics of the resulting archeological record. For example, different transect intervals could be simulated and the survey results of these simulations tallied in terms of numbers and sizes of sites. A fall-off curve could be constructed to show when the return on labor investment, number of recorded sites of size X, is exceeded by the cost of such information.

A related aspect of this question involves the investigation of site boundaries. As discovered by many investigators, few surveyors identify the same site boundaries given the same artifact distribution (Judge 1981, Plog et.al. 1978). Site boundary criteria based on density or artifact proximity could be simulated using the point-provenienced and grid-provenienced artifactual data from the Seedskadee Project. Again, characteristics of the resulting archeological record, such as numbers and sizes of sites, could then be evaluated. A more interesting analysis of this question would also consider how artifact assemblage content changes with different types of site boundary criteria.

One other possible topic of study concerns the ability to anticipate the nature of the archeological record given information about geomorphology. Wandsnider and Ebert (1983a) outlined expectations for the archeological record in terms of density and integrity of artifacts in different geomorphological provinces. The Seedskadee data base coupled with qualitative information about geomorphological processes obtained from aerial photography could be used to address this question. Numbers, density, size,

sorting, and degree of clustering of artifacts are indices which we suggest might be sensitive to the operation of different geomorphological processes. The results of such a study would be useful in planning archeological surveys in similar environments.

A final suggestion concerns the long-term representativeness of the current Seedskadee data base. We observed this summer that the project landscape was active and that artifact visibility fluctuated from day to day. Thus, it would be interesting to resurvey some or all of the same units at a future date to assess the nature of this dynamic. During this future survey, more efficient and more accurate procedures could be implemented. The results of these revisits may have implications for cultural resource management: the continued monitoring of a small piece of land may be of equal or greater utility than a one-time extensive survey of a large area.

To close, we feel that the ramifications of the Seedskadee Cultural Resource Assessment Project are tremendous. The data generated by the project are priceless in terms of the methodological and theoretical questions which can now be asked. We anticipate that the profession of archeology will benefit from the wealth of new questions generated by these data and by their pertinence to the unaddressed old questions.

REFERENCES CITED

- Binford, Lewis R.
1978 Dimensional Analysis of Behavior and Site Structure: Learning from an Eskimo Hunting Stand. American Antiquity, 43(3):330-361.
- Carr, Christopher
n.d. The Nature of Organization of Intra-site Archaeological Records and Spatial Analytic Approaches to Their Investigations. In Advances in Archaeological Method and Theory, Vol. 7, edited by Michael Schiffer, (in press). New York: Academic Press.
- 1981 Dissecting Intrasite Artifact Distributions as Palimpsests. Paper presented at the Annual Meeting of the Society of American Archaeology. San Diego, California.
- Ingbar, Eric, Signa Larralde, and LuAnn Wandsnider
1983 A Technical Proposal for a Cultural Resources Sample Survey in the Seedskadee Cultural Resources Assessment Project Area Southwestern Wyoming, RFP No. 7029-3-0015. Chambers Consultants and Planners, Albuquerque, New Mexico.
- James, Steven E., Ruthann Knudson, Allen E. Kane, and David A. Breternitz
1983 Predicting Significance: A Management Application of High Resolution Modeling. Paper presented at the "Predictive Modeling of Archaeological Site Location" symposium of the Annual Meeting of the Society of American Archaeology. Pittsburgh, Pennsylvania.
- Judge, W. James
1981 Transect Sampling in Chaco Canyon: Evaluation of a Survey Technique. In Archaeological Surveys of Chaco Canyon by A. C. Hayes, D. M. Brugge, and W. James Judge, pp. 107-137. Washington, D.C.: National Park Service.
- Kintigh, Keith W., and Albert J. Ammerman
1982 Heuristic Approaches to Spatial Analysis in Archaeology. American Antiquity, 47(1):31-63.
- Larralde, Signa
1984 Quality Control in Lithic Analysis: A Test of Precision. Submitted to Haliksa'i, University of New Mexico student professional publications series. Albuquerque, New Mexico.
- Nance, Jack
1983 Regional Sampling in Archaeological Survey: The Statistical Perspective. In Advances in Archaeological Method and Theory, Vol. 6, edited by Michael Schiffer, pp. 289-357. New York: Academic Press.
- Plog, Stephen, Fred Plog, and Walter Wait
1978 Decision Making in Modern Surveys. In Advances in Archaeological Method and Theory, Vol. 1, edited by Michael Schiffer, pp. 383-421. New York, Academic Press.

Rogers, Alan

- 1983 Data Collection and Information Loss in the Study of Spatial Pattern. World Archaeology, 14(2):249-258.

Simek, Jan F., and Roy R. Larick

- 1983 The Recognition of Multiple Spatial Patterns: A Case Study from the French Upper Paleolithic. Journal of Archaeological Science, 10:165-180.

Stahl, David W., and James E. Dunn

- 1982 An Analysis and Application of the Size Distribution of Waste Flakes from the Manufacture of Bifacial Stone Tools. World Archaeology, 14(1):84-97.

Wandsnider, LuAnn, and James I. Ebert

- 1983a Modeling Climatic and Landform Factors Affecting the Character of the Archaeological Record in Arid Lands: A Remote Sensing Approach in Southwestern Wyoming. Paper presented at the "Arid Lands" symposium of the Western Social Science Association Annual Meeting. Albuquerque, New Mexico.

- 1983b Accuracy in Archaeological Surface Survey in the Seedskadee Project Area, Southwestern Wyoming. Paper presented at the "Archaeological Survey Methodology" symposium of the 1st Meeting of the Society of Independent Anthropologists. Albuquerque, New Mexico.

Whallon, Robert

- n.d. Unconstrained Clustering for the Analysis of Spatial Distribution in Archaeology. In Intrasite Spatial Analysis in Archaeology, edited by H. J. Hiekala, in press.

BLANK PAGE

ACCURACY IN ARCHAEOLOGICAL SURFACE SURVEY IN THE SEEDSKADEE
PROJECT AREA, SOUTHWESTERN WYOMING

LuAnn Wandsnider
James I. Ebert

Department of Anthropology
University of New Mexico
Albuquerque, NM 87131

December 12, 1983

A Paper Delivered at a Symposium on
"Archaeological Survey Methodology"
at the meeting of the Society of Independent Anthropologist
November 12, 1983, Albuquerque, New Mexico

ABSTRACT

In the summer of 1983, an archaeological survey was conducted on Bureau of Reclamation lands surrounding the Seedskadee Wildlife Refuge in southwestern Wyoming. This survey was designed to be amenable to the analysis of formation processes responsible for archaeological deposits. Transect intervals were 5 meters, all recovered artifacts were mapped, and all artifacts were described while in the field. This study reports on a test of the accuracy of the field survey procedure which had been designed to discover all visible surface archaeology. The results of this test are presented and suggestions for improving survey accuracy are made.

Introduction

The archaeological record is a fabrication, albeit an honest one. It is constructed by archaeologists and is not only the product of prehistoric activities but also how we find, measure, analyze, and interpret this product. The utility of this fabrication depends upon how careful we are in controlling its manufacture. However, it is very rare to find a discussion of "quality control" in the manufacture of the archaeological record (but see Judge 1981, Plog, *et al.* 1978, and Judge, *et al.* 1975). This paper examines one aspect of the archaeological fabrication process over which the archaeologist has some control: the discovery and recording of surface archaeological remains. We will attempt to self-consciously evaluate how well our survey methodology recovers the surface archaeological remains. Before turning to an assessment of methodological accuracy, we will first describe a survey methodology implemented in the Green River Basin of southwestern Wyoming and our reasons for designing this methodology.

"Levels" of Archaeology: The Inequivalence of Human Behavior and the Archaeological Record

The archaeological record cannot simply be treated as a reconstruction or "reflection" of the day-to-day activities of prehistoric peoples. Rather, it is the sum of several different kinds of processes which modulate the content and structure of the archaeological record (Binford 1978, 1979, 1981, 1982; Foley 1981a, 1981b). It is almost universally assumed by anthropologists -- whether explicitly or (more often) implicitly -- that the archaeological record and archaeological sites are direct reflections of past activity sets. In most if not all cases, however, the archaeological record exists on a level far different than that of episodic human behavior. Such different levels can be brought to bear upon one another only through middle-range theoretical arguments relating the statics of the archaeological record with a number of different dynamic processes that are responsible for the creation of the record. These "middle range" processes include:

- 1) The systemic processes of human organization, particularly mobility and the activities which are related to that mobility;
- 2) The behavioral processes of discard, loss, and abandonment that produce the material consequences of activities, creating a record primarily due to discard rather than being the sum of all human activities in any simple way;
- 3) The different tempos of natural processes in conjunction with the varying tempos of cultural discard and abandonment processes result in an archaeological record in which the cultural remains in a strata or depositional unit may represent 2 or 1000 years of human behaviors. In a riverine situation, for example, cultural deposits may be sealed by annual flood events while in a more geomorphologically stable situation, many years of discard, abandonment, and even pirating of the still exposed cultural remains result in an archaeological assemblage representing much more time. Thus, it is only rarely that single discard events can be identified in the archaeological record. More commonly, these processes result in the overlap of the products of discard

through time within depositional units or strata, causing the archaeological record to differ from behavioral (discard) events in the time scale of its representation; and

4) Post-depositional natural and cultural processes which affect the preservation, integrity, and visibility of the archaeological record.

The character of archaeological deposits and the methodologies we, as archaeologists, attempt to apply to these deposits in order to understand the functioning of past systems is determined by all of these processes. The resultant archaeological record is relatively continuous across the landscape, and in many if not most cases it is the product of past discard events one atop another. It is not in any sense the simple "reflection" of what people did in the past. Yet, after several decades of archaeological fieldwork, the only words we have to describe archaeological deposits of varying time content are derived from episodic behaviors. We cannot "figure out" the archaeological record simply by trying to imagine that we are prehistoric people and thinking about what we would have done. The concepts that link the archaeological record with past human episodic behavior must be middle-range concepts, and these are not common in archaeological parlance. We still need to devise these concepts, and the only source which we can rely on in doing so is the archaeological record itself -- not imagined constructs based on facile reconstructions or "just so stories" concerning this record.

The processes which separate the archaeological record from episodic human behavior have been elaborated in a previous paper (Ebert et al 1983). Basically, they have the effect of removing the archaeological record from the "level" of episodic human behavior to the extent that one cannot equate the two without first carefully and completely recognizing, measuring, analyzing and dissecting the patterning of the archaeological record at one place. Only then can these places be understood as parts of past behavioral systems which have been altered by the differences between the sum of human materials use vs. discard at a specific place, by phase differences between discard episodes and depositional episodes, and by post-depositional processes. This cannot be accomplished using a "site" concept in which clusters of cultural material as found in the present are sampled, but requires the total recovery and analysis of all possible artifactual material. Archaeologists should realize that "sites" are not the static counterparts to behavioral episodes, activity sets, occupations, strategies, organizations, adaptations, or any other behavioral or theoretical entity. "Sites" only exist because the archaeologist fabricates them from clusters and artifacts and features, and in so doing creates a monster with unpredictable and unknowable characteristics. What we find in the archaeological record can only be linked to past human behavior and higher-level behavioral constructs through an explicit analytical approach. This must in turn begin with the conscious recovery of all possible evidence, at all loci, of patterning in the record. It is for this reason that we decided, early in 1983, to implement a "non-site," "off-site," or distributional archaeological survey strategy in the Seedskadee Project Area of the Green River Basin of southwestern Wyoming during the summer of 1983. In this survey, the artifact rather than the "site" was the unit of discovery, mapping, attribute coding, and analysis.

As an aside at this point, we would like to say that it is not difficult to anticipate some of the objections that other archaeologists will have to a distributional survey strategy. One of the most prominent of these is to say that

this is "all well and good for you Southwestern archaeologists, but what about in the humid and vegetated East and South?" The only argument we can think of at this time to counter this objection is that none of us are dealing with the "complete" archaeological record in any sense -- it has all been modified by depositional and post-depositional processes. While it may be less difficult to sort out these processes in the Southwest, it is not easy by any means. It is a problem for all archaeologists. Another related objection is that "we can't recover everything -- we are forced to sample." "Sampling" the distributions of archaeological materials, sad to say, is not a solution to dissecting the patterning of archaeological materials. There is no way, given the present state of archaeological knowledge and understanding, to know anything through "sampling" other than an inventory of what has been recovered. If archaeology is to advance, if we are to come to learn anything about the organization of prehistoric systems, then we must attempt to recover everything in archaeological distributions over relatively large, contiguous areas where the products of past behavior are manifest. (Of course, it is impossible to recover all surficial archaeological remains but if we can know what is missed -- and why -- then this is as good as having recovered everything.) Note that this means more work for archaeologists, but also perhaps more jobs for archaeologists as well. Rather than engaging in meaningless model building based on site samples derived from an unknown population, we first need to collect good data consistent with the nature of the archaeological record and amenable to its analysis.

Distributional Archaeology and Field Methodology

Given the nature of archaeological deposits, that they are spatially extensive and continuous, that they have varying integrity and grain, and that information can be derived as much from their structure as their content, we recognized a need to obtain a freeze-frame of the surface archaeology on a portion of land. Since it is the relationships between artifacts as well as attributes across a landscape that will yield information on the genesis of the archaeological record, the unit of observation must be the artifact rather than the site. At the same time, it would be useful to see the spatial organization of a number of artifacts distributed through a space much larger than that in which discrete human activity episodes tend to occur.

Non-site surveys have been conducted in the past, but we found none of them adequate for the purposes of capturing reliable information about content and structure of archaeological remains. That is, no such surveys have been carried out with the goal of searching for patterns in the covariation of artifacts and artifact attributes across space. For example, while Foley (1981a) recognized that prehistoric activities and their depositional "fallout" are not confined to "sites", his method of sampling small, oddly-shaped parcels of land precludes searching for regular spatial patterning in artifacts except on a very small scale.

To fill this methodological vacuum, we designed a survey procedure using the artifact as the unit of observation. The survey consisted of three phases: the encountering of artifacts, the in-field coding of attributes, and the recoding of provenience information for these artifacts on the surface of well-defined segments of the landscape. This was implemented on Bureau of Reclamation land surrounding the Seedskadee Wildlife Refuge in Southwestern Wyoming during July and August of 1983, as follows.

Twenty-five survey units, 500 meters on a side, were randomly selected, were located in the field and were "set up." In order to insure an even and intensive coverage of

the unit by the discovery crew, it was critical that a transect interval of 5 meters be maintained. This was made possible by "setting up" transect guides, pinflags, on opposite sides of the unit at 25 meter intervals. The members of the discovery crew could thus align and realign themselves with each sweep through the survey unit.

Once the survey unit has been prepared, the discovery crew was dispatched to it, armed with orange pinflags and mechanical tally counters. The crew consisted of five persons, with several years each of survey experience, who, upon finding an artifact, would mark it with a pinflag and tally it. Time, quality of light, temperature, and other weather conditions were noted for each sweep as were the artifact totals for each crew member.

Upon completion of the discovery of artifacts in a unit, the artifact attribute coding team would follow. This crew was made up of 2 or 3 individuals, each with experience in coding attributes of chipped stone artifacts. In addition to coding artifact attributes, this crew would proceed through a unit assigning unique numbers to each of the orange flags so that the artifact descriptions would be coordinated with artifact locations. If other artifacts were discovered at this time, these were red-flagged to distinguish them from those discovered previously. Selected attributes for all flagged objects, artifacts, features, and firecracked rock, were also recorded at this time. Where artifact density was high, the coding crew imposed a grid of 1 meter x 1 meter cells over the concentration in order to expedite mapping which proceeded much more slowly than attribute coding.

The third crew, the mapping team, was responsible for recording the locations of pinflags. This was accomplished by one person, who operated an Electronic Distance Measurement (EDM) theodolite, and a rodperson, who communicated pinflag numbers via radio and positioned the prism used to reflect the EDM's infrared beam at each shot.

In this fashion, twenty-five 500 meter x 500 meter units were surveyed and some 17,000 observations were made on artifacts and features in this area in approximately seven ten-person weeks.

Accuracy of the Survey Methodology

Employing the discovery, encoding, and mapping procedures described above, we had hoped to recover reliable information about the structure and content of the surface archaeological record. Through high intensity survey, we hoped that the majority of the visible surface archaeological remains might be recovered. Given the goals we have set for the profession of archaeology, however, simply hoping that the archaeological record we were fabricating was of high fidelity was inadequate. We therefore designed an experiment to evaluate the accuracy of our survey procedure.

Accuracy refers to how closely an instrument measures reality. In this case, the question becomes: did our discovery method find all of the visible surface archaeology? What kinds of artifacts were missed? This question is to be distinguished from that of precision, which refers to the consistency of the results of a measuring device when it is applied to the same problem in the same manner. We were unable to test the precision of our methodology although we recognize how critical this is to evaluating the integrity of the archaeological record.

Whether or not an artifact is discovered is related to both features of the artifact

and features of the artifacts's context. For example, an artifact with a decidedly unnatural shape becomes more visible to the roving eye of the surveyor as does an artifact which has color contrast with that of the surface or a very large vs. a very small artifact. In addition, attributes of the environment such as quality of light and density of insects may influence the discovery of artifacts.

Other factors also contributing to artifact discovery are less easy to measure and include attributes of the surveyor. Eyesight capabilities, degree of boredom, hunger, thirst, bodily discomfort, etc. all affect to unknown degrees the "seeing" ability of the surveyor. More insidious because they are presently unavailable for our scrutiny are the conceptual biases each surveyor brings to a project. Just as a neophyte may see a totally different archaeology than a seasoned fieldhand, a "Schifferian" archaeologist probably recovers a very different archaeological record than a "Dunnellite".

In order to assess the accuracy of our discovery methodology, we "seeded" one of the units (Unit 24) with 202 "pseudo-artifacts": 107 washers (1.5 cm in diameter) and 95 concrete nails (5 cm in length). Washers and nails were chosen because of their unnatural yet standard shapes. We anticipated that more nails than washers might be found since they were slightly larger and thus more easily seen. Sixty of the washers were painted buff or off-white; the remaining washers were painted a matte black. Similarly, 58 of the nails were buff, while 37 were black. Black and buff lie at both extremes of the continuum of colors of the artifacts we were recording in the field. We expected that more black "pseudofacts" than buff might be discovered since the surface sediments of Unit 24 were very light in color.

The garden in which we planted these artifacts was one of the project survey units with a gentle rise to the south and an arroyo bounding it on the north. Vegetation was not thick but there existed marked variation in its density throughout the unit, being less dense in the western half and more dense in the east. Sediments were light colored and consolidated so that no telltale footprints were left by the seeding crew.

These modern artifacts were "planted" throughout the unit in nine different kinds of distributions. Eight artifact clusters, of varying density, type and color composure were constructed as described in Table 9-1. These represented our attempt to simulate "sites". In addition, 50 artifacts were placed throughout the unit to simulate "isolated occurrences" of artifacts. All of the latter were point-provenienced with the EDM and the boundaries of each cluster were recorded. Figure 9-1 shows the distribution of the seeded artifacts.

Two days after the seeding, during which time the weather remained sunny, the discovery crew swept through the unit flagging both prehistoric artifacts and introduced pseudofacts. In this discourse, we are concerned with the latter although it should be noted that, according to the discovery crew chief, many of the prehistoric artifacts found were discovered only because the survey crew was looking intently for the planted artifacts. The encoding crew then arrived and red-flagged more artifacts while coding artifact attributes.

A total of 133 or 66% of the seeded artifacts were rediscovered through this flagging process. Seventy-three percent of the black washers, 67% of the black nails, 65% of the buff washers and 56% of the buff nails were found. Table 9-2 breaks down the percent of artifacts recovered by various attributes of the artifacts. Color and type have a small effect on artifact recovery although relatively more black artifacts

Cluster	Name	TYPE		COLOR		Total	Area (m ²)	Density
		Washers	Nails	Buff	Black			
1	Buff	10	10	20	0	20	314	.064
2	Black	11	9	0	20	20	40	.500
3	Little Mixed	11	7	9	9	18	20	.900
4	Nail	0	10	5	5	10	314	.032
5	Washer	11	0	5	6	11	78	.141
6	Big Mixed	10	9	9	10	19	40	.475
7	Big Buff	10	20	30	0	30	40	.750
8	Big Black	20	4	0	24	24	28	.848

Table 9-1. Cluster Descriptions

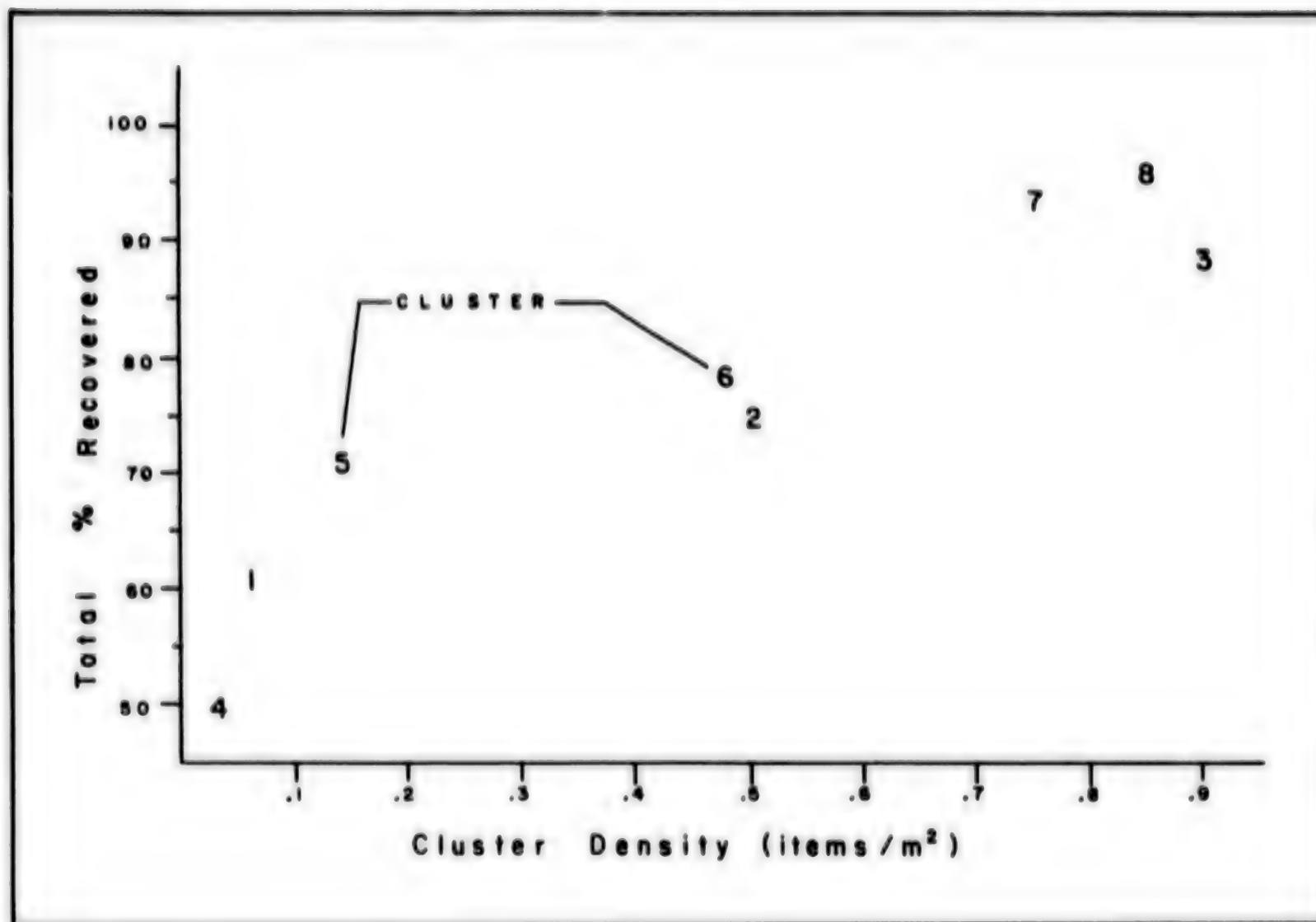


Figure 9-1. Cluster Density versus Percentage of Artifacts Recovered.

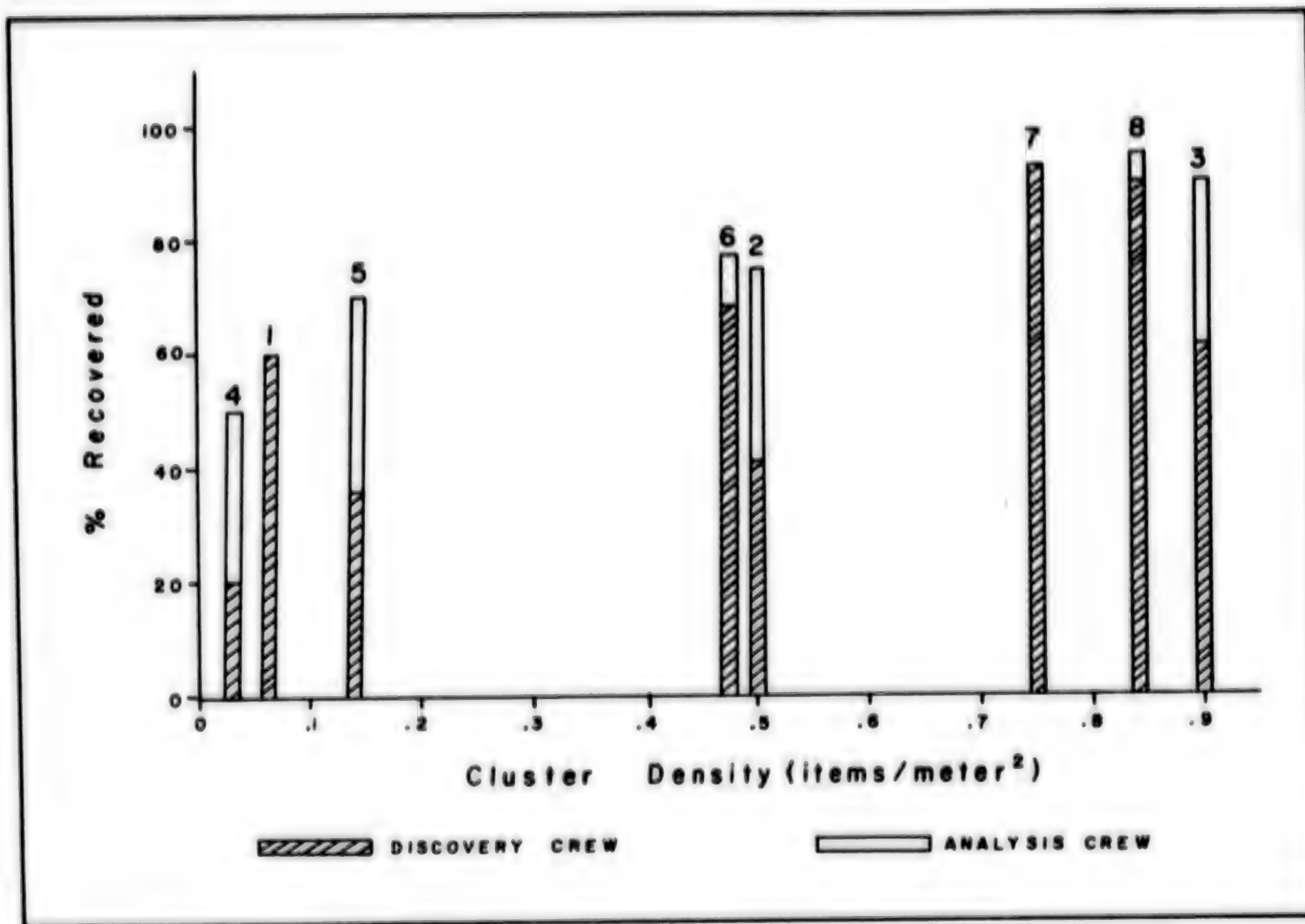


Figure 9-2. Cluster Density versus Percentage of Artifacts Recovered by Crew.

were recovered than were buff. This was expected since black stands out starkly on light sand. In addition, slightly more washers than nails were discovered. We had anticipated that the more elongate nails might be more easily recovered than the smaller washers. It seems, however, that since their surface areas are approximately the same, it is the degree of oddness in artifact shape that makes them more easily seen. This is, the very round washer (surface area = 2.0 square cm) may become more visible than the oblong nail (surface area = 2.25 square cm) because of its unnatural shape.

Most disturbing is the percentage of isolated artifacts -- that is, those artifacts purposely distributed not in clusters, but by themselves -- which went undiscovered by the survey crew. Only 11 or 22% of the isolates were recovered while 122 or 80% of the clustered artifacts were discovered. Considering just the clusters, it becomes obvious that the density of the artifact distribution is positively related to the percentage of artifacts recovered for that cluster. Figure 9-2 shows that as cluster density increases, so does the percent of artifacts recovered. We had hoped that with a 5 meter transect interval, a higher percentage of the isolates might be discovered. Thus it seems that searching intensity is related to expected payoff. That is, we are programmed to look hard for artifacts in the near vicinity of any artifact we happen to see and decrease the intensity of search as artifacts become scarcer. Perhaps site-oriented survey has maintained itself in American archaeology not because it is consistent with the nature of archaeological remains (for certainly it is not), but because it satisfies the Indiana Jones in each of us.

Examining who was responsible for finding what, it is clear, not surprisingly, that the discovery crew found most (111 or 55%) of the seeded artifacts while the follow-up analysis crew found an additional 10%. Table 9-3 shows that the discovery crew recovered almost equal percentages of black vs. buff artifacts, while the analysis crew found 3 times as many black as buff artifacts. The discovery crew also found slightly more washers than nails while the analysis crew found approximately equal shares of each. In terms of clustered vs. isolated artifacts, no clear pattern emerges. The discovery crew found a percentage of clustered artifacts more than 4 times that of isolated artifacts. Meanwhile, the analysis crew, who would be spending most of their time in the vicinity of the clusters, found in those clusters 2 times that percentage found in isolated occurrences. This is likely due to the fact that the discovery crew had already flagged most of the clustered artifacts leaving few to be picked up by the analysis crew. Figure 9-3 shows that in general, as cluster density increases, so does percent recovered by the discovery crew. When those artifacts found by the analysis crew are added, this relationship between artifact density and probability of discovery, if you will, is strengthened.

To summarize these results, it seems that an artifact in the near vicinity of another artifact has a much greater chance of being found than an isolated artifact. Dark color and an unnatural shape seem to enhance its chance of being discovered. The tenor of these results is certainly expectable, but the magnitude of the difference between percent recovered in clustered vs. isolated scatters is disquieting.

Quality Control in Archaeological Survey

It is clear from the above that it is very ostrich-like to assume that the known archaeological record is a true reflection of potentially available surface archaeology. Indeed, it is a sloppy scientist who speaks from results produced by instruments of unknown accuracy and precision. With this in mind, we contend that it

	C O L O R		T Y P E		P R O X I M I T Y	
	Buff	Black	Washer	Nail	Clustered	Isolate
F O U N D	60%	71%	70%	61%	80%	22%
N O T F O U N D	40%	29%	30%	39%	20%	78%

Table 9-2. Percent of Artifacts Found and Not Found by Attribute.

A T T R I B U T E		C R E W		T O T A L
		Discovery	Analysis	
Color	Buff	56%	5%	61%
	Black	54%	17%	71%
Type	Washer	60%	10%	70%
	Nail	49%	11%	60%
Proximity	Clustered	68%	12%	80%
	Isolated	16%	6%	22%

Table 9-3. Percent Artifact Recovery by Crew

Seedskadee Cultural Resource Assessment Project

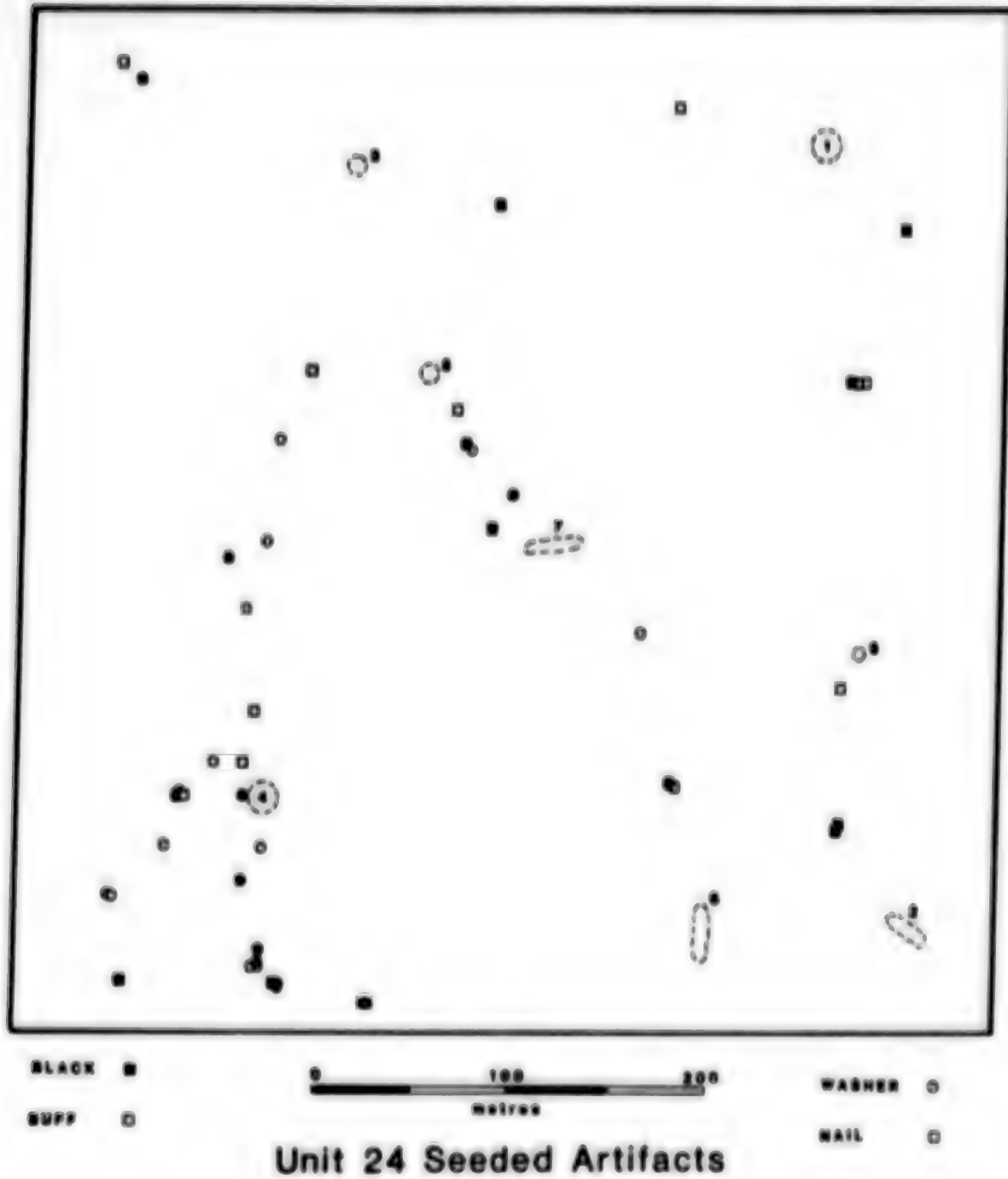


Figure 9-3. Unit 24 Seeded Artifacts.

is imperative that other studies of this ilk be conducted.

To assess the accuracy of a distributional archaeological survey, we suggest the following. Palynologists introduce an exotic spike such as Eucalyptus pollen into their sediment samples which behaves, as it endures the reduction process with other pollen grains, in a known manner. This allows them to look at pollen recovery rates per volume of sediment. In a similar fashion, we suggest the introduction of known numbers of modern artifacts with known characteristics in a random distribution throughout a survey unit. Since the discovery of artifacts is not only related to their attributes but also to their proximity to other artifacts, however, recovery rates of isolated and clustered prehistoric artifacts will vary to unknown degrees. Differences in these recovery rates could only be assessed through a deliberate planting program such as we have executed here. Deliberate planting of control artifacts in areas to be surveyed, of course, requires additional effort and prediscovery activity. However tempting it may be to imagine some sort of mechanical device that could distribute pseudofacts randomly throughout a survey unit, at present the only means of seeding are manual and tedious.

In addition to evaluating accuracy, ways of increasing the recovery percentages of isolates bear further exploration. Two possibilities suggest themselves: (1) survey each unit twice and/or (2) institute an artifact bounty program. It took between 6 and 12 hours to survey each of the 500 meter x 500 meter units depending on the number of artifacts encountered. By decreasing unit area from 250,000 sq. meters to 122,500 sq. meters (a 350 meter x 350 meter unit), the unit could be walked once north-south and then again east-west. Half as much space would be covered in the same amount of time and the recovery rate of artifacts no doubt would rise.

The second suggestion involves implementing an artifact bounty system reminiscent of the days of Sir Flinders Petrie. Such a system might operate as follows. Each discovery crew member would maintain one unique flag color. Thus, it would always be possible to know who had flagged what. Bounties would be paid on items flagged that were actually determined to be artifacts by the analysis crew. Bounties could even be prorated based on proximity to other artifacts. That is, discovery of isolated artifacts might be awarded a higher bounty than the discovery of more clustered artifacts. Of course, penalties would be incurred for flagging freshly broken artifacts or noncultural items. This may reek of capitalism but we suggest it offers additional incentive for doing a thorough survey beyond the thrill of "a good job well done".

Precision was not specifically addressed in this paper but clearly an accurate, but imprecise, instrument is just as undesirable as an inaccurate instrument (see Larralde, this volume, for a discussion of precision in artifact attribute coding). Precision of a survey methodology can be measured through repeated survey of the same unit. Alternately, it could be easily assessed in the course of a random-seeding program in which variability in modern artifact recovery is evaluated.

Perhaps the above suggestions appear bizarre, at best, and costly, too. It seems to us, however, that before making up stories about the past supposedly founded on the content of the archaeological record, the quality of that record should be examined. It seems possible that the variability in the stories generated to date are as much a result of how the archaeological record was constructed by archaeologists as of differences in ancient cultures. Science is not the use of high-technology in and of itself. Rather, science involves the deft manipulation of refined measuring instruments, like survey methodologies, to extract accurate and precise information

about, in this case, archaeological deposits.

Concluding Remarks

We have evaluated the archaeological record we are presently constructing for the Seedekadee Bureau of Reclamation lands in southwestern Wyoming. We find that our discovery methodology returns results somewhat different from our expectations. Namely, even though it is intensive and designed to find isolated as well as clustered artifacts, it is successful at this perhaps 20% of the time. Even so, the very tight relationship between artifact density and probability (in a nonstatistical sense) allows us to calibrate the information we do have on the incidence of artifacts within the survey unit. This information will be used to decide which portions of the archaeological record we have generated are amenable to pattern-searching techniques requiring high fidelity.

This study has implications for more traditional sorts of archaeological survey in which sites and isolated artifacts are recorded. Even at our survey intensity and with our apparently low rate of isolate recovery, we nevertheless found artifacts everywhere. Thus, we are bewildered that anyone can make any sense of the few isolated finds discovered through traditional survey.

References

Binford, Lewis R.

1978 Munamit Ethnoarchaeology. New York: Academic Press.

1979 Organization and formation processes: Looking at curated technologies. Journal of Anthropological Research, 35:255-273.

1981 Behavioral archaeology and the "Pompeii Premise". Journal of Anthropological Research, 37(3):195-208.

1982 The archaeology of place. Journal of Anthropological Archaeology, 1:5-31.

Ebert, James I., Signa Larraide, and LuAnn Wandsnider

1983 Distributional Archaeology: Survey, Mapping, and Analysis of Surface Archaeological Materials in the Green River Basin, Wyoming. Paper presented at a symposium on "Current Archaeological Research in Southwestern Wyoming" at the Forty-first Annual Plains Conference at Rapid City, South Dakota.

Foley, Robert

1981a Off-site Archaeology and Human Adaptation in Eastern Africa: Analysis of Regional Artifact Density in the Amboseli, Southern Kenya. Cambridge Monographs in African Archaeology, No. 3, BAR International Series, No. 97.

1981b Off-site Archaeology: An Alternative Approach for the Short-sited. Pattern of the Past: Studies in Honor of David Clarke. I. Hodder, G. Isaac, and N. Hammond. Pp. 157-183. Cambridge, GB: Cambridge University Press.

Judge, W. James

1981 Transect Sampling in Chaco Canyon--Evaluation of a Survey Technique. Archaeological Surveys of Chaco Canyon. A. C. Hayes, D. M. Brugge, and W. J. Judge, eds. Pp. 107-137. Washington, DC: National Park Service.

Judge, W. James, James I. Ebert, and Robert K. Hitchcock

1975 Sampling in Regional Archaeological Survey. Sampling in Archaeology. James W. Mueller, ed. Pp. 82-123. Tucson: University of Arizona Press.

Plog, S. F., F. Plog, and W. W. Wait

1978 Decision Making in Modern Surveys. Advances in Archaeological Method and Theory, Vol. 1. Michael B. Schiffer. Pp. 383-421. New York: Academic Press.

**DISTRIBUTIONAL ARCHEOLOGY
SURVEY, MAPPING, AND ANALYSIS OF SURFACE
ARCHEOLOGICAL MATERIALS IN THE GREEN RIVER BASIN, WYOMING**

**James I. Ebert
Signa Larralde
LuAnn Wandsnider**

November 1, 1983

**A paper delivered at the 41st Plains Conference
at a symposium on "Current Archeological Research
in Southwestern Wyoming" chaired by Judy K. Michaelsen
Rapid City, South Dakota, November 2-5, 1983**

Introduction

Archaeology in America today is in a quandary. This is especially true for that portion of the profession responsible for investigating and managing the surface archaeology of large tracts of land. The quandary concerns how to maximize the amount of information about the archaeology of an area given finite budgets. Predictive modeling, a technique for projecting knowledge derived from a sample to its universe, has been proposed as one response to this dilemma. We shall present another response, distributional archaeology, which is designed to collect quality information about the archaeological record and is consistent with the formation and structure of that data base.

Inherent in all archaeological modeling attempts are assumptions about the nature of the archaeological record. These assumptions must be questioned in light of the formation processes that are responsible for the archaeology potentially available to us. Before examining how the archaeological record is formed, we briefly examine some of the prejudgements archaeologists make about their data.

Conceptual Biases

Most archaeological work done throughout the world today revolves around the concept of the site. Just what a "site" is is rarely explicitly discussed, but generally, most archaeologists believe that sites exist and that they are useful analytic units for assessing prehistoric behavior. That is, sites mean something in terms of past cultures and this something is knowable to the archaeologist. Associated with the concept of the site are ancillary concepts of site function and site significance. Most archaeologists also believe that by carefully considering the content of a site and by comparing it to sites produced by contemporary aboriginal groups, an archaeologist can assign to it one or several discrete functions. Significance refers to how much information a given site, within the constructs of regional research, contributes to the archaeological community (James, et al. 1983). Generally, a site which is rare, very old, very large, or very complex is interpreted by the archaeologist as significant. Conversely, a non-significant site is either common, small, diffuse, or of a single-component.

Methodological Biases

Concomittant with assumptions about what the archaeological record consists of are assumptions about how to best "see" it. Given that archaeologists believe sites to be useful carriers of information about prehistoric behavior, methodologies designed to find sites are developed. This is not always explicit even in the mind of the archaeologist, we believe, but is still a methodological fact. If the goal is to locate all "significant" sites in an area, and if significant sites are of size y , then transect intervals of $f(y)$ are used to find them. The concept of the site guides how archaeological survey is conducted and also defines the description of surface archaeology.

As discussed by Plog et al. (1978), however, both site recognition criteria and site description conventions are rarely consistent within or between survey projects. It becomes very possible then that interpretations of prehistoric behavior derived from the archaeological record most likely result from how we have trained ourselves to "see" the archaeology to as great an extent as what is really there on or in the ground.

Below we shall discuss how the formation of the archaeological record, a complex process at best, demands that we question the concept of site and its utility for helping us understand the past. Further, while certainly we can recognize differences in the contents of sites, it is unclear, given the nature of the archaeological record, that simple functional assignments can be made. Lastly, once we consider how the archaeological record is formed and how it can be translated into information about the past, the concept of the assessment of the significance of portions of the archaeological record becomes completely reversed.

These considerations entail the realization that present methodologies for finding and describing surface archaeology are inadequate. The Seedskadee Cultural Resource Assessment Project was designed to record the surface archaeology of a sample of Bureau of Reclamation land surrounding the Seedskadee National Wildlife Refuge (Lincoln and Sweetwater Counties, southwestern Wyoming) in a manner consistent with the structure of the archaeological record. Our perception of the formation processes responsible for the archaeological record, and the sort of survey methodologies necessary to properly record these, is the focus of the next sections of this paper.

Episodic Behavior vs. the Archaeological Record

It is almost universally assumed by anthropologists -- whether implicitly or explicitly -- that the archaeological record and archaeological sites are reflections of past activities or activity sets. In approaching and designing the Seedskadee survey, we chose not to make these assumptions. We feel that in most if not all cases, the archaeological record exists on a different level than that of episodic human behavior. These different levels can be brought to bear upon one another only through middle-range theoretical arguments relating the statics of the archaeological record with a number of different sorts of dynamic processes responsible for the creation of that record. These processes include:

- 1) The systemic processes of human organization, particularly mobility and the activities which are the causes of mobility;
- 2) The behavioral processes of discard, loss and abandonment that produce the material consequences of activities, creating a record of discard rather than of the sum of all human activities;
- 3) The interacting processes of discard and deposition, separated by phase differences which result in the overlap of the products of discard through time within depositional units, causing the archaeological record to differ from human behavioral events in the time-scale of its representation; and
- 4) Post-depositional natural and cultural processes which affect the preservation, integrity, and visibility of the archaeological record.

At the risk of sounding overly "theoretical," we would like to discuss each of these processes briefly. This is extremely important in making a case for undertaking distributional survey, for the results of these processes and the ways they cause the fragmentation, superimposition, and differential preservation and visibility of the archaeological record between and within "sites" constitute a strong argument that the site concept is difficult (at best) to operationalize. Archaeologists simply do not know what "sites" in the archaeological record are, how they are bounded or

defined, or how they relate to human behavior, and the only way to approach an understanding of these problems is to carefully study what is contained in "sites" and between them using an unbiased methodology. We feel that one of the only ways to arrive at such an unbiased methodology is to ignore "sites" entirely in the recording and analysis of the archaeological record, a methodology we shall call distributional archaeology.

The Systemic Organization of Human Behavior

The places that people do things, the ways that they move between these places, and the different things that they do at different places are organized systemically rather than simply internally. In other words, the same people do different things at different places and times. The way that they organize what they do at which places varies, of course, with strategies which groups use to either most efficiently or perhaps just passably meet the challenges of feeding and provisioning themselves. In extremely diverse and "even" environmental settings, for instance the jungles of Southeast Asia and South America, there are human groups that tend to do just about their entire repertoire of activities everywhere, and who use the environment surrounding their residential camps in the manner of nearly perfect generalists. Resource procurement trips are taken outwards from the residential camp each day, and collectors return at night. This sort of adaptation has recently been referred to as foraging (Binford 1982), and in such an adaptation the debris discarded at each residence -- the single kind of "site" produced -- will all be essentially the same. The amount and variety of site contents will depend primarily on how many people occupied these residences for how long (Yellen 1977).

In most of North America, however, it is probably safe to assume that the people responsible for the archaeological record we find today were not perfect generalists. The environment here, particularly west of the Mississippi, is not diverse or even enough to permit the survival of generalists of the sort represented by Bushmen or Tassaday. Prehistoric Americans were to at least some extent specialists -- that is, they exploited the resources in their environment by targeting in on those resources which could be most efficiently procured (efficiency, here, should be understood in systemic terms and not necessarily simply calories per unit time). Specialists organize their mobility differently than do foragers, having a logistic organization (Binford 1982) in which activities are carried out at a number of functionally differentiated locations: residential camps, hunting camps, blinds or stands, and other special-purpose locations which are inhabited and used by subgroups staying away from the residence, in some cases, for substantial periods. Different sorts of simultaneously-used and -occupied sites in such a system look different. More important, however, in "confusing" the archaeological record left by logistically organized systems is the fact that when residences are moved, special-purpose sites and the old residence are re-used as activity locations, both often for different activities than before. Patterning within and between sites is the result of "...long-term repetitive patterns in the 'positioning' of adaptive systems in geographic space. Site patterning derives from repetition, or lack thereof, in spatial positioning of systems" (Binford 1982:6). If it could be viewed synchronically at one time, the regional archaeological record left by a single group of people organized in a logistical way would probably be interpreted by most archaeologists today as being "sites" made by several different cultures (on the basis of "diagnostic" artifacts being different with different site functions, sizes, and types). When viewed over even a short time period, this record will be even more confusing because of the overlap of different functions -- residential and

hunting-camp, for instance -- at the same places. This may well be the situation within the later Plains Archaic, for instance.

Discard Behavior and the Archaeological Record

Discard behavior and the fact that the archaeological record is formed when items are discarded, lost or abandoned is acknowledged explicitly by recent "behavioral" and "garbage" archaeologists. Unfortunately, these archaeologists still seem to think that everything that people use is dropped where and when tasks are completed or at some other location in a simple way, resulting in a "frozen" archaeological record which provides a direct reflection of past events. Artifacts can be discarded in the context of their use, but probably far more often they were not. Instead, especially within specialized, logistically-organized systems with planned procurement activities at known, sequential locations, artifacts would have been produced at one place, curated for use at another, and maintained to be used multiple times. When this is the case, one would expect artifacts to be found in the contexts of their maintenance and replacement. More realistically, one would expect to find parts of artifacts and their byproducts at different places: debitage from point shaping and thinning at a quarry where the point was made; resharpening flakes where the point was used expediently as a knife; a point tip as an "isolated occurrence" where it was broken against a rock; and the broken base of the point at a residential camp where the point was replaced in its haft. The "pieces" found at different places needn't necessarily be literally from one artifact, either. They might be "pieces" of assemblages (sets of artifacts), or even attributes of artifacts and their combinations in assemblages. The archaeological record in a curated technology can be expected to be composed of sets of things that do not necessarily occur together at the same places in all cases.

This poses great problems for the archaeologist, who must be able to put all of these pieces back together again. While the solution to this problem will not be discussed here, it is clear that to measure and "piece together" such distributions, we must keep track of where each artifact or item is found both within sites and between them, or better yet across a landscape. Methods are required which allow the archaeologist to analyze the entire range of complex discards that track individual artifacts, toolkits, and planned activities through the system.

Despositional vs. Behavior Events and Processes

When items are discarded, lost or abandoned they leave the cultural realm and are subjected to depositional processes which transform them into part of the archaeological record. Depositional processes may be cultural, as in the case of burial of materials in pits; more often, however, they are natural processes consisting of fluvial, aeolian, lacustrine, or residual aggradation. These natural processes of deposition may or may not coincide with episodes of cultural discard of materials. Materials may lie on the surface for long periods of time without being buried, or may be quickly covered as they are disposed of. In some situations, particularly in arid environments, materials may never be buried and may remain forever on the surface of the ground forming a palimpsest. Archaeologists almost universally assume that materials buried in layers or "levels" are the undisturbed reflection of single occupational episodes. In reality, materials from sealed sites may well have been disturbed while they lay on the surface awaiting deposition, and subsequent episodes of occupation or activity superimposed atop previously-discarded materials may be sealed into a single discernible stratum as well.

The nature of the deposited archaeological record is not simply the result of discard, but rather of the "tempo" (Binford 1982:16) of the occupation or use of place and its relationship to the periodicity of depositional processes. At a riverside logistic site which is re-used in the course of a year for several episodes with the same or different functions, for instance, one might expect episodes of discard to be more frequent than deposition caused by the rise of spring floodwaters. This would result in single-layer "assemblages" composed of materials from more than one occupation and very probably more than one function. As a result, "...demonstrably associated things may never have occurred together as an organized body of material during any given occupation" (Binford 1982:17-18).

Looking for and lumping the materials from buried "cultural layers" is not the way to sort out the wholly or partially superimposed patterning resulting from phase differences in the occurrence of depositional and discard events. New methods of recording and analyzing the exact relationships between the items which compose the archaeological record are required in order to "pick apart" this kind of patterning. It has been suggested that one analytical technique that might be used in the analysis of subtly overlapping patterning is digital filtering of distributions across space (Carr 1982). Such analysis virtually requires the collection of point data. In addition, the difficulty of defining "site" boundaries which might in many cases blur the distinctions between the edges of partially overlapping patterns argues for discarding the relatively meaningless site concept in measurement and analysis of such distributions.

Natural Processes Affecting the Deposited Archaeological Record

Once the archaeological record is deposited, another set of processes begins to act upon it. These can be thought of as post-depositional processes, although it should be kept in mind that they can act to alter or destroy archaeological materials and patterning prior to deposition as well. Nearly all of the processes which affect the surface of the earth also act upon the archaeological materials upon or within it: biological processes such as "faunalturbation" and "floralturbation" (Wood and Johnson 1978); chemical and physical processes such as freeze/thaw cycles, mass wasting, salt crystallization, swelling and shrinking of clays, volcanism and tectonism, and disturbances caused by the action of gas, air, wind, water, and pedogenesis (Wandsnider and Ebert 1983). These natural processes can alter the spatial patterning of artifacts on the land surface, can act to differentially preserve and destroy culturally-deposited items, and can cause exposure of buried deposits and subsequent reburial of either wholly or only partially altered materials. While one might be tempted to think of post-depositional processes as destructive, at least some are vitally important to archaeology because in many cases, buried materials are also invisible and unknown to the archaeologist. Even using expensive and time-consuming geophysical or chemical discovery methods, only a small portion of the subsurface archaeological record is even likely to be found. Natural processes must make part or all of buried deposits visible before these can be dealt with. It is only on the very narrow threshold between exposure and disturbance that most archaeological materials are valuable to archaeologists.

Natural processes which bury, expose and sometimes rebury and expose (ad infinitum?) archaeological materials are usually a combination of more than one of the types listed above. For instance, the lowering of artifacts contained within a sand dune to an interdunal surface has both aeolian and gravitational components. These processes are affected drastically by small differences in topography, soils, and the

like and for this reason are often highly localized in space. This introduces complexities which are often at a scale much smaller than that of assumed "sites". In a dune environment, for example, portions of the material record resulting from two separately-deposited but subsequently deflated activity episodes might be mixed at one place while only a few feet away they will be separately stratified or unexposed and invisible. Much of what is thought to be "site boundaries" during survey is very likely the result of just such localized, differential exposure of materials. Methods of measuring and analyzing the archaeological record which allow the recognition of the parts of the record we do not see as well as those we do are required if the effects of natural processes and their differential effects are to be "filtered out" of what archaeologists record prior to thinking about the past behavioral patterning responsible for the archaeological record.

Continuous Archaeology -- Views of Function and Significance

The systemic nature of human mobility, the effects of curation and the anticipatory manufacture and use of components of technical systems, disparities between the tempo of episodes of discard vs. episodes of deposition, and the post-depositional action of natural processes on deposited materials all combine to insure that the archaeological record in most if not all places is complex. It exists on a "level" quite different from that of specific episodes of human behavior. What is more, the complicated overlaying brought about by these processes results in an archaeological record that, at least in many places, does not exist as discrete "sites" or activity sets, but is rather of a dispersed, continuous nature (Dunnell and Dancey 1983; Foley 1980, 1981a, 1981b; Isaac and Harris 1975; Thomas 1975).

All archaeologists who have done surface survey have encountered situations in which it was difficult to decide where sites ended and where other sites began. We would suggest that this is because of the sort of implicit, unstated, and vague internalized notions that archaeologists have held concerning the equivalence between behavioral episodes in the past and "sites" as they exist in the present. Specific, single, ongoing ("real life") human occupations may be bounded in space and time, and can be thought of as sites if one wants to call them that. In the archaeological record, however, "sites" are not bounded, they do not begin nor do they end, and in fact they do not exist as the counterpart of behavioral episodes, activities, occupations, strategies, organization, adaptations, or any other reconstructional or theoretical entity.

Further, it is clear that different nodes on the landscape will assume many different functions through time. Rather than discussing what function a "site" had, it is more meaningful to look at variability in occurrence and co-occurrence of attributes and of artifacts through space.

When the above considerations are taken into account, the significance of the archaeological record assumes a wholly different emphasis. It should be clear that we need to begin to work on unravelling the distributions that are the most comprehensible to us given the complexity of archaeological formation processes and the current state of development of archaeological methodology. Information about the past can best be extracted from those parts of the archaeology of an area which are redundant and easily analyzed. We can only begin to find patterns in the surface archaeology if there exists some amount of redundancy in that data. In essence, then, the parts of the archaeological record which can contribute the most information at present, and which thus must be considered highly significant, are

low-density, redundant distributions. These are the materials that are sparse, simple, and common.

The Seedskadee Project Survey Design

Given that the archaeological record assumes the form described above, the behavioral level entities which are the actual endpoint of archaeological and cultural resource studies must be measured at a nonsite level. The Seedskadee survey was designed as an experiment in systematic survey methodology toward this end. Two propositions were kept in mind in designing the survey: that units of analysis (which here include units of discovery as well) structure not only what is written about after the survey is over but indeed what is found during fieldwork (Binford and Sabloff 1982), and that very little is known about what the archaeological record means or about what it looks like. Consequently, the units of analysis employed during the survey had to be units with little or no meaning already attached. Therefore attributes of artifacts were chosen as the units of mapping and data recording, and artifacts were chosen as the unit of discovery. The survey was designed for maximum data recovery of these units of discovery and analysis.

We recognized that results of the survey would be influenced first by what is found, i.e. strictures about what is recognized as an artifact plus bias inherent in the discovery procedure; secondly, by what is considered to be appropriate to record; and thirdly by how it is recorded -- the format of data recording. An attempt was made to control each of these three influences in a self-conscious explicit manner. This was done by planning and executing the survey in three ways that differ from the ways that traditional surveys are usually conducted.

Despite the profuse lip service paid to the importance of preparing research designs before going into the field, it is clear from many CRM survey reports that the planning phase of surveys is usually given short shrift. The reason for this lies partly in the straight-jacket structure of RFP's, which specify results and often also the means of arriving at them; and with the firmly entrenched methodology of CRM archaeological survey, based as it is on the belief that fieldwork is 95% of archaeology and that the data are self-evident. In contrast a proportionately large amount of preparation time was spent on this survey, mainly in defining the survey goals and the means we were going to use to achieve those goals. Secondly, tasks usually handled by one traditional survey crews were divided up so that three crews, each with an internally consistent and redundant job to do, were responsible for accomplishing a sector of the survey goals. Thirdly, it was necessary to maintain a flexible attitude about trying new methods and changing methods in the field when they didn't yield the results we wanted.

Initially, a random sampling design was employed to choose a number of 500 x 500 meter sample units in the Seedskadee Project Area (Ebert 1983). The sample was not stratified by environmental zones, although geomorphological and vegetation data from aerial photographs and Landsat space imagery were examined earlier to assess the feasibility of stratification (Wandsnider and Ebert 1983). The environmental zonation thus derived is thought to better represent zones of differential surface geomorphological processes than past natural conditions, and will be employed in later stages of the analysis of the Seedskadee data in an attempt to "factor out" the affects of these processes on the behaviorally-formed archaeological record. Sample units were prioritized by the order in which they were chosen so as to maintain the randomness of the sample, since little information was available prior to the fieldwork about the time frame necessary for doing this kind of survey. Twenty-five

of the units were completed. Emphasis throughout the survey was on the quality of information recorded within the units rather than on using the units as a basis for extrapolating to huge surrounding areas. The spatial analysis of data from these units will not assume that this data base is a "sample," but will instead concentrate on internal patterning and be directed toward interpreting the systemic components of the composite, overlaid archaeological record.

The Field Methodology in Action

Responsibility for data recovery was delegated to three separate crews, a discovery crew, a mapping crew and a data recording crew. The success of the survey depended to a large extent on crew cooperation, but there was little overlap in crew tasks (Ebert 1983, Inghar, Larralde and Wandsnider 1983). The fact that each crew was able to carry out their respective activities apart from the other crews contributed greatly to the information yield of this project, a subject that we will discuss later in this paper.

The five members of the discovery crew were responsible for finding artifacts and for maintaining even ground coverage. To insure that they did this in a controlled, systematic way, sample units were located and laid out prior to the discovery phase. The corners of the units were staked and flagged, and the opposite ends of the unit in the direction that it would be walked were pin-flagged at 25 meter intervals. This assured that even if one sweep went awry, it could be immediately corrected without affecting the accuracy of the remainder of the sweeps to be done, because the exact end point of each sweep was set in advance. Since the discovery crew surveyed at 5 meter intervals, this level of sweep precision was essential; a Brunton compass is not precise enough to guide sweeps under these specifications.

The discovery crew was equipped with tally counters and orange pin flags. They flagged artifacts as encountered and kept track of artifact totals per sweep with the counters. Sweep position was maintained by each person for the duration of the survey. At the end of a sweep, the crew chief recorded the number of artifacts found by every crew member during the sweep. Also recorded on a sweep-by-sweep basis were beginning and ending times and weather conditions, as well as other conditions that had an impact on the crew, the most severe of which was probably density of insects. The crew was directed not to go back to areas they had already covered during the sweep. Although it is probably impossible to control for all of the real-time contingencies of field survey, we feel that this methodology approximates an unbiased discovery scheme far better than most previously-applied designs.

The mapping crew was responsible for provenience control of artifacts, all of which were mapped except under very high density conditions when one meter grids became the provenience unit. The crew consisted of a crew chief who operated the electronic distance meter and a rod person who walked from flagged artifact to artifact with a prism and relayed artifact numbers back to the crew chief via radio.

The data recording crew consisted of a core of three individuals who numbered pin flags in cooperation with the mapping crew and recorded artifact attribute data using artifact code sheets and fortran computer coding forms. Data was recorded in a format designed for easy computer input after the fieldwork phase of the project was completed, a necessity due to the enormous data base generated.

When additional artifacts were found, they were flagged with red pin flags. The structure of these red-flagged distributions approximates the results of traditional

"site " survey. These data are not internally comparable nor are they comparable to orange-flagged distributions in intensity of ground coverage. As a rule, artifact concentrations received more attention than interlaying areas, as is the case with traditional survey methods. Red-flagged areas often doubled or tripled the number of artifacts recorded in a sample unit.

The end product of these procedures is a data base with maximum flexibility for looking for patterns among attributes in space. This consists of some 170,000 attributes, predominately locational data and lithics descriptors. A series of pattern-finding mechanisms will be used to find redundancy in the data -- that is, to find groups of attributes that consistently co-occur. It is also anticipated that digital filtering and power-spectrum or Fourier analyses will be utilized to "sort out" overlapping activity patterning in the data. Such approaches are impossible without point-provenienced data for artifacts over relatively large, contiguous areas such as those dealt with in this project.

Initial Survey Results

In this post-fieldwork phase of the project the effectiveness of our survey methodology can be evaluated. Although exhaustive data analysis remains to be done, impressions distilled from the prehistoric data base can be summarized:

1. There are prehistoric artifacts everywhere, i.e. in all environmental zones, in differing (but usually unexpectedly high) densities and in many different kinds of distributions that appear to vary by both spatial configuration and content. It seems that the kinds of distributions encountered at Seedskadee would confound the usual methods of doing predictive modeling (i.e. defining environmental parameters for site location) because the data base is gradational.

2. The harder one looks, the more one finds. Although this is a simple observation, its repercussions for management of archaeological resources are profound, since RPP's generally emphasize acreage surveyed per dollar spent rather than cultural resources located. It is our impression that the perception archaeologists have of the archaeological record is a direct function of the context of discovery: survey interval, time spent on sweeps or on flagging concentrations or on recording contents of grid squares, external and internal crew conditions. Thus our data, although certainly more complete than most, must be viewed as a sample of artifacts from a constantly changing unknown universe.

We also observe that "surface" and "subsurface" are relative dynamic terms. This point is easily illustrated in areas like dunes where the act of discovery, mapping and data recording changes the surface archaeology: artifacts are buried and uncovered through scuffling and trampling during the course of survey itself. Non-collecting survey is not necessarily (and perhaps is never) non-destructive of the archaeological record. Although survey such as we undertook at Seedskadee disturbs the location of artifacts, it is

likely that a far more important destructive force is alteration of the soil's surface and of vegetation which will affect the rate and nature of local natural processes in the future in the area impacted.

3. You can't make a silk purse out a sow's ear. Error, variability and sources of bias in methodology and results must be evaluated and explained. Researchers pretend that these do not exist at the expense of the reliability of their data and the aptness and utility of their results. To address such problems, two "control" experiments were introduced into the project to help evaluate data reliability. In the first, a sample unit was seeded with "pseudofacts": nails and washers painted to approximate the color of the ground and natural lithic materials occurring in the area. These were flagged and recorded by the discovery crew, yielding information about accuracy of the discovery procedures. Approximately 75% of the seeded "pseudofacts" were recovered; these results will be discussed at length in a future paper. In a second methodological experiment, a single manufactured lithic assemblage was independently coded by the three principal data recorders. This will provide information as to the consistency of coding procedures and possible data skew due to the idiosyncracies of the coders.

4. A systematically organized, multi-component survey crew allows portions of the crew to complete their task at their own speed and under ideal conditions. The use of three crews (discovery, mapping and analysis) which could essentially work "on their own" in this survey facilitated greatly the yield of actual product (in terms of information) per person-hour worked. In a period of approximately seven ten-person weeks, some 170,000 attributes were recorded for artifacts. This is the information equivalent of more than 3,300 IMACS prehistoric site forms (the site coding form currently being used in Wyoming -- see University of Utah 1983). Although the amount of ground "covered" (625ha or 1544.33 acres) during this time may be less than for most traditional, 15-30m transect spacing surface site surveys, the information yield is staggeringly greater. This we feel, is due not only to the objectives and methodology employed in fieldwork in general, but also to the modular crew organization used.

The information-yield argument is very important, we feel, when considering the cost-effectiveness of any field data collection program. What is to determine the "effectiveness" part of this equation -- amount of "ground covered" about which virtually nothing is known, or the amount of useful archaeological data recovered? We feel that the latter criterion is obviously the more important, and must not be given short shrift in determining what survey methods and intensities should be employed. We are obliged as archaeological scientist to get something of

value from even a very small amount of land rather than getting little if anything from "100%" of an area to be impacted in the future.

5. Although data are not yet computerized for extensive spatial manipulation, our impression is that we are finding far more "sites" (using definitions of "site" applied in other surveys having taken place in the last few years in the immediate project area) than are found during traditional surveys. This is true even if allowance is made for the intensity of our survey. Our survey was 3-6 times as intensive as 15-30m transect interval surveys done recently in the area; our impression is that, using others' empirical definitions of what "sites" are constituted by, we are probably finding from 10 to more than 50 times as many "sites" as they did. This means that linear or sinusoidal intensity-to-yield models of surface survey results such as that presented by Judge (1981) are either unwarranted, or that we did not reach the hypothetical "falloff" point even at a 5m transect interval. Are even smaller transect intervals necessary in certain situations?

6. Field observation during the course of the Seedskadee summer 1983 field season revealed that the scale of patterning of the natural processes which affect the visibility, preservation and integrity of the archaeological record are of a very local nature. These processes are controlled by local topography and other small-scale factors, and are thus often of an even smaller scale than might be assumed to fall within the boundaries of culturally-caused clusters of artifacts. As discussed above, it is important to "factor out" the effects of natural depositional and post-depositional processes before one can decide what cultural patterning looks like. This means that extremely localized, small-scale geomorphological mapping and process measurements over time may be absolutely necessary before any "predictive model" or artifact or site distributions can be arrived at. The implications for contemporary regional-scale predictive modeling are quite clear: that simplistic, gross "environmental" zones are inappropriate and insufficient for describing the distribution of the archaeological record.

Summary and Conclusions

Predictive modeling as it is employed by archaeologists today seeks to make accurate statements about the nature of the archaeological record throughout a large area. That is, it attempts to maximize the amount of information about the archaeology of a specific region. However, as we have detailed, the formation processes responsible for the archaeology potentially visible to us is structurally inconsistent with a site-oriented record as produced by most contemporary archaeological surface surveys. Because of conceptual and complementary methodological biases, the full information content of the archaeological record has not yet been broached.

Through distributional archaeology, a methodological approach we feel is consistent with the structure of surface archaeology, we argue that both quality and quantity of information about the past is maximized.

References

- Binford, Lewis R.
1982 The archaeology of place. Journal of Anthropological Archaeology 1:3-31.
- Binford, Lewis R., and Jeremy A. Sabloff
1982 Paradigms, systematics, and archaeology. Journal of Anthropological Research 38(2):137-153.
- Carr, Christopher
1982 The nature of organization of intrasite archaeological records and spatial analytic approaches to their investigation. In Schiffer, Michael B., ed., Advances in Archaeological Method and Theory, Vol. 6. New York: Academic Press.
- Dunnell, Robert C. and William S. Dancey
1983 The siteless survey: A regional scale data collection strategy. Schiffer, Michael B., ed., Advances in Archaeological Method and Theory, Vol. 3. New York: Academic Press.
- Ebert, James I.
1983 Request for Proposal No. 7029-3-0015: Cultural Resources Sample Survey in the Seedskadee Cultural Resources Assessment Project Area, Southwestern Wyoming. Santa Fe, NM: U.S. Department of the Interior, National Park Service. Manuscript on file at Branch of Remote Sensing, National Park Service, P.O. Box 26176, Albuquerque, NM 87126.
- Foley, Robert A.
1980 The spatial component of archaeological data: Off-site methods and some preliminary results from the Amboseli Basin, Southern Kenya. Proceedings of the VIII PanAfrican Congress in Prehistory and Quaternary Studies, pp. 39-40.
- 1981a Off-site archaeology: An alternative approach for the short-sited. In Hodder, I., G. Isaac, and N. Hammond, eds., Patterns of the Past: Essays in Honor of David L. Clarke, pp. 157-183. Cambridge: Cambridge University Press.
- 1981b Off-site archaeology and human adaptation in eastern Africa: An analysis of regional artifact density in the Amboseli, southern Kenya. BAR International Series 97 (Cambridge Monographs in African Archaeology 3). Oxford, England: British Archaeological Reports. pp. 256.
- Ingbar, Eric, Signa Larralde, and LuAnn Wandenider
1983 A Technical Proposal for a Cultural Resources Sample Survey in the Seedskadee Cultural Resources Assessment Project Areas, southwestern

Wyoming, RFP No. 7029-3-0015. Prepared for the U.S. Department of the Interior, National Park Service, Southwest Region, May 1983. Albuquerque, NM: Chambers Consultants and Planners, 2051 Yale Blvd. SE, Albuquerque, NM 87106

Isaac, G. Li. and J. W. K. Harris

- 1975 The scatter between the patches. Paper presented to the Kroeber Anthropological Society, May 1975.

James, Steven E., Ruthann Knudson, Allen E. Kane, and David A. Breternitz

- 1983 Predicting significance: A management application of high-resolution modeling. Paper presented at the 48th annual meeting of the Society for American Archaeology at a symposium on "Archaeological Sites Location Predictive Models: Derivations and Applications, Pittsburgh, PA, April 30, 1983.

Judge, W. James

- 1981 Transect sampling in Chaco Canyon -- Evaluation of a survey technique. In Hayes, A. C., D. M. Brugge, and W. James Judge, eds, Archeological Surveys of Chaco Canyon. Washington, DC: National Park Service.

Plog, S., F. Plog and W. W. Wait

- 1978 Decision making in modern surveys. In Schiffer, Michael B., ed., Advances in Archaeological Method and Theory, Vol. 1, pp. 383-421. New York: Academic Press.

Thomas, David H.

- 1975 Nonsite sampling in archaeology: Up the creek without a site? In Mueller, J. W., ed., Sampling in Archaeology, pp. 61-81. Tucson: University of Arizona Press.

University of Utah

- 1983 IMACS Users Guide. Intermountain Antiquities Computer System. Salt Lake City, UT: Archeological Center, Department of Anthropology.

Wandsnider, LuAnn, and James I. Ebert

- 1983 Modeling climatic and landform factors affecting the character of the archaeological record in arid lands: A remote sensing approach in southwestern Wyoming. Paper presented at the Silver Anniversary Meetings of the Western Social Science Association and the Association for Arid Lands Studies, April 27-30, Albuquerque, New Mexico.

Wood, W. Raymond and Donald Lee Johnson

- 1978 A survey of disturbance processes in archaeological site formation. In Schiffer, Michael B., ed., Advances in Archaeological Method and Theory, Vol. 1. New York: Academic Press.

Yellen, John A.

1977 Archaeological Approaches to the Present. New York: Academic Press.

Quality Control in Lithic Analysis: A Test of Precision

by
Signa Larraalde
Department of Anthropology
University of New Mexico

Introduction

Few archaeologists would argue against the desirability of working with an accurate, precise data base. Yet attempts to identify sources of inaccuracy and imprecision in archaeological data are almost unheard of (for an exception, see Fish 1978). Instead, archaeologists have naively chosen to view their data as an error-free direct result of prehistoric behavior. Quantification of observation error is standard practice in other disciplines and is one means of laying the groundwork for strong inference.

In this paper, sources of error in the controlled lithic analysis of an experimental assemblage are examined. The resulting information will be used to evaluate the amount and kinds of bias in a large data base made up of lithic attributes coded during last summer's Seedskaadee project in southwestern Wyoming. At Seedskaadee, all lithics found by the survey crews in 25 500 x 500 meter sample units were analyzed and piece-plotted in the field (see Wendenider and Ebert, this volume, for a description of field methodology). A data base consisting of attributes of some 17,000 items was produced. Before patterning in these data can be used as a source of inference, various kinds of discovery and recording errors need to be identified and evaluated. The "controlled lithic analysis" is one step towards this end: It is a consistency test in which the three principal Seedskaadee data coders independently coded the same lithic assemblage.

The consistency test addresses the question of precision in data coding but not the question of accuracy. Precision deals with replicability of results. Replicability is rooted in the degree to which attribute codes are clearly defined and mutually exclusive and to the presence of an independent measuring tool such as calipers or a metric scale. Precision does not deal with the fineness or grossness of the measurements themselves, only with the reliability of the measurers in applying previously specified attribute parameters. An accuracy test, on the other hand, would ask, "Does the measurement actually describe the object" and might resort to a finer measuring tool, to some consensus of judgment, or to expert judgment for defining the range of error.

Although results of consistency tests may be painful as well as enlightening, replicability in analysis is a cornerstone of scientific method. It ensures quality control, especially in circumstances of contemporary fieldwork that prevent researchers from returning to their data base. Common examples are large complex-site excavations in which sherds or debitage are sorted, then disposed of, or non-collection surveys in which artifacts are field-analyzed. In either case, replicability in analysis must be assessed either during the data analysis or with an independent assemblage before or after analysis. Plans for incorporating before-, during- and after-analysis tests would undoubtedly produce the highest quality data. Unfortunately, such plans are rarely if ever made.

Fish (1978) carried out a number of consistency tests with sherds and with lithics. He found that sources of error for both qualitative and quantitative variables included difficulties in applying a measuring technique, imprecise definitions of attribute states, and unconscious change in criteria by the same analyst over time. He was able to identify attributes with an unacceptably high magnitude of coder discrepancy, and he was able to identify

Some consistent coder idiosyncracies in ceramic classification information that can form the basis for decisions to change measurement techniques or to "smooth" patterned idiosyncracies in the data. Minimally, confidence intervals can be constructed for each attribute, informing the researchers as well as the archaeological community about the degree of observation error.

Seedsakdee In-field Coding and the Consistency Test

The choice of the attributes and attribute codes has a large bearing on the results of consistency tests. In this case, the in-field lithics form was developed and lab-tested on a small sample of lithics prior to Seedsakdee fieldwork. Much of the form was based on attributes and attribute codes that had been successfully used on other projects. Coding equipment included a code sheet reproduced on durable photographic paper, a fortran code pad, and a metric ruler, all of which fit easily on a legal-sized clipboard. During the first ten-day session of fieldwork, the form was streamlined and ambiguous sections were modified. The form remained the same and appeared to be workable and well-understood by the coders for the duration of fieldwork.

Coder training also influences test results. The three principal coders all had considerable previous experience in lithics analysis. Training consisted of two of the coders working as a pair (with one person scribing for the other) and comparing calls on attributes for one to two days, i.e. calls on 200 to 500 artifacts. Additionally, the recording crew usually worked in proximity; problematic artifacts were often discussed, questions asked, and calls compared. Given this background, consistent results on the test were expected.

After fieldwork, a lithic assemblage was manufactured, unfortunately using raw materials exotic to southwest Wyoming. From it, 200 items were selected to represent items and attributes commonly found during the project. Non-cultural items were included. The assemblage was presented to the coders with forms, directions to code the same way as during fieldwork, and a warning about the exotic lithic materials and the possible inclusion of non-artifacts. Comments, suggestions, and complaints were solicited.

Scheduling problems caused a delay of nearly three and a half months between the inception of the test project and completion of the test by the last coder. This delay led to skews in test results, mainly due to difficulties in remembering the coding conventions. Data from the completed fortran forms were entered into the University of New Mexico IBM 3180 computer, and SAS programs were run to compile results.

Results

Continuous, ordinal, and discrete variables are represented on the test, as shown in Table 11-1. Table 11-2 summarizes analysis of variance Tukey means test results on the continuous variables. Discrepancies between Coder 3 and Coders 1 and 2 in measurement of length stem from Coder 3 using a different measuring technique, i.e. length measured perpendicular to platform vs. length

measured along the longest axis. Thickness discrepancies stem from use of a different measuring technique by Coder 1: estimation to the nearest millimeter using the metric scale rather than measurement using calipers. Still, confidence intervals for Coder 1 are within .5 mm of the mean, even though they surpass the .05 level of significance. Dorsal scar results show a .05 level of significant difference between Coders 1 and 3. This translates to an actual difference of plus or minus one scar. Coder 1 consistently inflated the number of scars, while Coder 3 consistently deflated the scar count. Table 11-3 presents coder idiosyncracies in measuring dorsal scars and the ordinal variables.

Ordinal variables represent gross breakdowns of continuous measurement. Cortical cover, for example, was measured in four intervals, while a slightly finer six-interval scale was used for measurement of total edge modification and total surface modification. Tables 11-4 and 11-5 summarize results of the ordinal and discrete variable tests. For the ordinal tests, Coder 1 again tended to inflate estimates, while coder 2 deflated the six-interval scale estimates.

Larger discrepancies occur in all the five discrete variables. The variable "type" differs from the other variables in that decisions about several attributes are necessary in order to "type" an item. The 18 codes for the variable "type" are nested into seven clusters, so that, for example, coders might agree that an item is a flake, but disagree as to what kind of flake it is. There is a 22.9% vs. 10.2% difference in mean total disagreement vs. mean within-cluster disagreement for the variable "type". Nineteen of the total of 88 disagreeing calls (21.6%) involve discrepancies in whether an item is a distal flake fragment or angular debris.

For other variables, percent of disagreement ranges from 4% to 42%. Percent of surface modification has the highest overall rate of disagreement, and breakage has the lowest overall rate of disagreement.

Discussion: A Stand Against Throwing the Baby out with the Bathwater

Before the Seedskadee data base is abandoned because of less-than-ideal results in the consistency test, the implications of the results should be considered. Three courses of action come to mind: correcting the data using information we now have about each coder; redesigning the attribute definitions; and defining standards of accuracy and precision meaningful in the context of behavior.

Patterns have emerged in coder responses for at least five variables with high discrepancy rates. These patterns may be used to construct coder-specific "signatures" (sets of coder idiosyncracies in inflating some variables, deflating others, in short, in responding in a predictable way) for smoothing data. Tables 11-3 and 11-6 are directed at identifying these patterns in preliminary fashion. More sophisticated statistical techniques such as cluster analysis by coder may also be appropriate.

Using the test data, variables can now be ranked in order of precision (Table 11-7). Test results point to sources of ambiguity in the structure of the data; ambiguity in attribute definitions needs to be evaluated prior to

further analysis. The outcome is a rethinking of recognition problems (e.g. is there in fact a recognisable distinction under field conditions or otherwise between angular debris and distal flake fragments?) and a rethinking of the questions these variables were designed to address (e.g. do we care?).

Decisions about discrete "type" variables influence other variable decisions. For example, the decision that an item is angular debris rather than a flake fragment produces a "not applicable" completeness code and leads to an inflated rate of disagreement for the variable as well as for the "type" variable. The problem with the discrete variables seems to be one of imprecise definitions of attribute states. As discussed above, types are composites of attributes and a combination of decisions is required to "type" an object. The amount of precision in typological classification depends on the precision and cohesiveness of these individual decisions. Here, it is clear that the "within-cluster" type definitions are so vague as to be easily misconstrued. Before further fieldwork, the definitions must be honed. As for the extant data base, differences between within-cluster types must be reevaluated. Perhaps some of these types can be eliminated with no analytical loss. Another option is to do away with the within-cluster types completely, and use other attribute data (e.g. platform, length, thickness) to define them.

An increase in the number of ordinal variable intervals to choose from leads to a decrease in precision. Interval scales are particularly difficult to define and are likely to be a source of imprecision, whatever the context of use. Fish (1978:88) reported disagreement rates in the 30% to 40% range for an eight-interval scale. Here, the six-interval scale used for measuring surface and edge modification yields 31.6% mean disagreement compared to 10.2% for the four-interval scale used for cortex cover. Vagueness in estimating the missing part of an item is probably responsible for the higher 19.4% mean disagreement rate for completeness, which was measured with a three-interval scale. Descriptive accuracy, however, demands more intervals, not less. Should accuracy be compromised? Or precision?

For the continuous variables, confidence intervals tell us about the amount of observation error. But how precise is precise enough? Standard statistical significance levels may provide guidelines for confidence interval acceptability. These may or may not be meaningful, however, in terms of behavior, which is, after all, what we are interested in measuring. Independent methods of assessment are needed. Experimental lithics studies can perhaps answer questions of behavioral meaning that cannot be answered by tests of precision.

In summary, if utility is measured in terms of what was learned about the data, the test must be judged a success. Although it would have been "nice" to have achieved 100% agreement among the three coders on all variables, the results of the test set realistic parameters for data manipulation and contribute to a position of strength in conducting defensible analyses. We now know about the extent and kinds of bias in the data, rather than pretentiously assuming that there is none or vaguely assuming that there is probably some degree of bias somewhere.

Given these rates of disagreement among three experienced coders working in constant communication on the same crew all summer and using a lab-test coding form, one wonders about the degree of unassessed, unreported observation bias

inherent in other typical archaeological coding situations. Some examples come to mind: A large number of artifacts is collected during a summer project. For the next several years, numerous students are employed, one after the other, to code the lithics with little supervision. No checks are made on data quality, but eventually a computer analysis of the data is described in a glossy publication. Or a deadline fast approaches on a large contract project and hordes of workers quickly join the payroll to complete the lab work or the fieldwork. Repercussions for data quality in either example seem obvious. In the absence of an standard practice of evaluating bias, one must take most archaeological attribute analyses with a healthy dose of skepticism.

Table 11-1. Variables Coded

Continuous:

Length, to the nearest 5mm
 Thickness, to the nearest 1 mm
 Dorsal scar count: 1 through 9, 9 = 9 or more

Ordinal:

Completeness

less than 1/2
 more than 1/2
 whole
 not applicable
 indeterminate

Cortical covering

none
 less than 50%
 more than 50%
 total
 indeterminate

Percentage of Post Detachment Edge Modification

none
 less than 5%
 6-25%
 26-50%
 51-75%
 76-100%
 indeterminate

Percentage of Post Detachment Surface Modification

none
 less than 5%
 6-25%
 26-50%
 51-75%
 76-100%
 indeterminate

Discrete:

Type

core
 bipolar
 single platform
 multiplatform
 blade core
 angular debris
 flake
 biface thinning
 bipolar
 pressure/retouch
 tested cobble
 chunk

uniface

biface

biface 1
 biface 2
 biface 3

other

not an artifact

Platform Characteristic

missing
 cortical
 crushed
 non-cortical single facet
 non-cortical multiple facet
 ground
 other
 indeterminate

Breakage

whole
 tip
 base
 midsection
 whole, tip crushed/battered
 whole, tip broken
 whole, base broken
 reworked
 broken/indeterminate fragment

Table 11-2. Continuous Variable Results:
Analysis of Variance Tukey Means Test

Variable	Coder Comparison	Lower Confidence Limit	Difference in Means	Upper Confidence Limit
Length (in mm) n = 136	1 - 2 1 - 3 2 - 3	-0.8 2.2 2.0	-0.2 3.1 3.0	1.2 4.3* 4.1*
Thickness (in mm) n = 136	1 - 2 1 - 3 2 - 3	0.6 0.4 -0.1	1.0 0.8 0.3	1.5* 1.2* 0.7
Dorsal Scar Count n = 136	1 - 2 1 - 3 2 - 3	-0.2 0.0 0.1	0.1 0.3 0.2	0.5 0.6* 0.5

* Comparisons significant at the 0.05 level

Table 11-3. Ratios of High to Low Coder Disagreements
on Continuous and Ordinal Variables

Variable	1	Coder 2	3
Dorsal Scar	27:10	12:13	10:17
Completeness*	10:16:1	13: 7:1	8:6:32
Cortical Cover	6: 4	14:14	2:12
‡ Edge Modification	5: 3	1: 6	0: 4
‡ Surface Modification	6: 2	1: 5	3: 1

* high:low:not applicable/indeterminate

Table 11-4. Percentage Disagreement in Coding of Ordinal Variables

Variable	n	mean %	Coder					
			1		2		3	
			n	%	n	%	n	%
Completeness	177	19.4	32	18.1	22	12.4	49	27.7
Cortical Cover	173	10.2	10	5.8	28	16.2	15	8.7
% Edge Modification	27	28.6	8	29.6	8	29.6	7	25.9
% Surface Modification	24	36.7	10	41.7	8	33.3	7	29.2

Table 11-5. Percentage Disagreement in Coding of Discrete Variables

Variable	n	mean %	Coder					
			1		2		3	
			n	%	n	%	n	%
Type								
expanded	189	22.9	48	25.4	41	21.7	41	21.7
collapsed	189	10.2	15	7.9	18	9.5	25	13.2
Platform	83	20.5	12	14.5	19	22.9	20	24.1
Breakage	25	9.3	4	16.0	2	8.0	1	4.0

Table 11-6. Frequency and Percentage of Collapsed Types in Assemblage

Type	Coder					
	1		2		3	
	n	%	n	%	n	%
Core	10	5.3	5	2.7	9	4.8
Angular Debris	9	4.8	11	5.8	27	14.3
Flake	140	74.0	137	72.5	128	67.7
Chunk	1	0.5	4	2.1	4	2.1
Uniface	9	4.8	14	7.4	4	2.1
Biface	16	8.5	17	9.0	16	8.5
Other	0	0.0	1	0.5	1	0.5
Not an artifact	4	2.1	0	0.0	0	0.0

n = 189

Table 11-7. Noncontinuous Variables Ranked in Order of Precision: Most to Least

Rank	Variable	% Disagreement
1	Breakage	9.3%
2	Cortical Covering	10.2%
2	Type-collapsed	10.2%
3	Completeness	19.4%
4	Platform characteristics	20.5%
5	Type-expanded	22.9%
6	% Edge modification	28.4%
7	% Surface modification	34.7%

REFERENCES

DeBoer, Warren

1980 Vessel Shape from Rim Sherds: An Experiment on the Effect of the Individual Illustrator. Journal of Field Archaeology 7:133-135.

Fish, Paul R.

1978 Consistency in Archaeological Measurement and Classification: A Pilot Study. American Antiquity 43(1):86-88.

BLANK PAGE

A MODEL OF POSSIBLE SITE CONCENTRATIONS ON BUREAU OF RECLAMATION LANDS NEAR THE SEEDSKADEE NATIONAL WILDLIFE REFUGE

by

Dwight L. Drager

INTRODUCTION

One of the primary objectives of this study is to attempt to determine areas of high and low archeological site concentration. A determination such as this can be of considerable use in the planning stages of future archeological survey in a project area. An estimate of the number of field days required to survey an area is vitally important to estimating the final total cost of that survey. For that reason, the Bureau of Reclamation requested a prediction of site concentrations within the project area so that future contract firms would have reasonable information on which to base bids to perform survey of the entire project area.

Another value of attempting to predict the concentration of archeological sites in an area is that that prediction can be tested if the area is ultimately to be totally surveyed, as is the situation in this case. A complete survey of the Bureau of Reclamation lands near the Seedskadee National Wildlife Refuge may not be completed for several years. However, once a prediction is made, it can be tested at any time in the future. The final survey of the area may show mistakes or inconsistencies in the prediction which can be adjusted or corrected as the survey continues. In this way, it may be possible to develop a model of site concentrations which will describe archeological distributions in the Seedskadee area. Such a model might even have explanatory power.

THE MODELING TECHNIQUE

The method chosen to model archeological site concentrations on the Seedskadee Project Area is one that has been used to model site concentrations on the Navajo Indian Irrigation Project in New Mexico (Drager, 1983). The Branch of Remote Sensing of the National Park Service has developed a computer-based system which integrates environmental information in a manner similar to that used by certain animal behaviorists and is known as "habitat modelling" (Beeman 1978). The technique assigns values (in the case of archeological information, it uses sites per hectare) to various zones on environmental maps. Several maps can then be combined to form a single map. Where zones coincide that have high values, a high value will be maintained. Where zones of low value coincide, a low value will exist. A final map is then created which shows the locations of the high and low values. This map is then taken as the model of high and low archeological site concentrations.

THE DATA BASES

Two separate data bases were used to develop the necessary information to create the model of archeological site concentrations for the Seedskadee Project Area. The first data base consists of the archeological sites discovered in or near the vicinity of the National Wildlife Refuge prior to work done in 1983. An extensive search was made of the records of the Wyoming State Historic Preservation Office Archive at the University of Wyoming in Laramie, Wyoming. All site forms for the area encompassed by the base map were copied and the information contained on them was transferred to the appropriate US Geological Survey 7.5-minute quadrangle map. These maps also contained the locations and extent of the archeological survey which discovered the sites. The areas of the surveys were then measured for each environmental zone and the number of sites within each zone was determined. Site concentrations were then calculated for each zone of each map. Environmental maps had been created for the geology (Fig. 12-1) of the project area and for the soils (Fig. 12-2) contained therein. Also, a map of the surface of the project area (Fig. 12-3) and termed a "geomorphological map" was made from Landsat imagery of the project area which had been enlarged to the same scale as the base map (Ebert and Wandsnider, this volume). These three environmental maps, soil, geology, and geomorphology, form the basis on which the predictive model (Fig. 12-4) is built. A second data base was developed by coding information from the site forms obtained from the Wyoming State Historic Preservation Office onto a modified version of an InterMountain Antiquities Computer System (IMACS) form. A computer program was written by Dwight Drager to operate on the Branch of Remote Sensing's Tektronix 4051 Graphics Computer Terminal which stores and retrieves the information contained on the modified IMACS forms. Just under 900 entries have been made on four 8 1/2 inch floppy disks which include information on the sample units examined during the summer of 1983 by Chambers Planners and Consultants in conjunction with this project. A complete printout of all information collected for this portion of the project is provided as an attachment to this report to the Bureau of Reclamation.

The archeological site concentrations in each of the zones as determined by existing site records are listed in Table 12-1. The predictive map for the Bureau of Reclamation lands surrounding the Seedskadee National Wildlife Refuge is an integrated map of the three environmental maps with zone concentrations taken for each map as listed under the heading "All Sites" on Table 12-1.

THE SECOND STAGE SAMPLE

The summer 1983 field survey conducted by Chambers Consultants and Planners can be taken as a second stage sample in the on-going examination of the Seedskadee Project area. Since the Chambers' survey used a non-site approach, the data collected by them is not directly comparable to the previously collected data. However, the data Chambers collected can be used for a number of different purposes. One of the things that can be done with the Chambers' data is to examine artifact concentration levels to see how they compare with levels of concentration anticipated by Ebert and Wandsnider (this volume) who made predictions regarding which zones on their geomorphological map should reveal high and low levels of artifacts.

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

Geology Zones Map

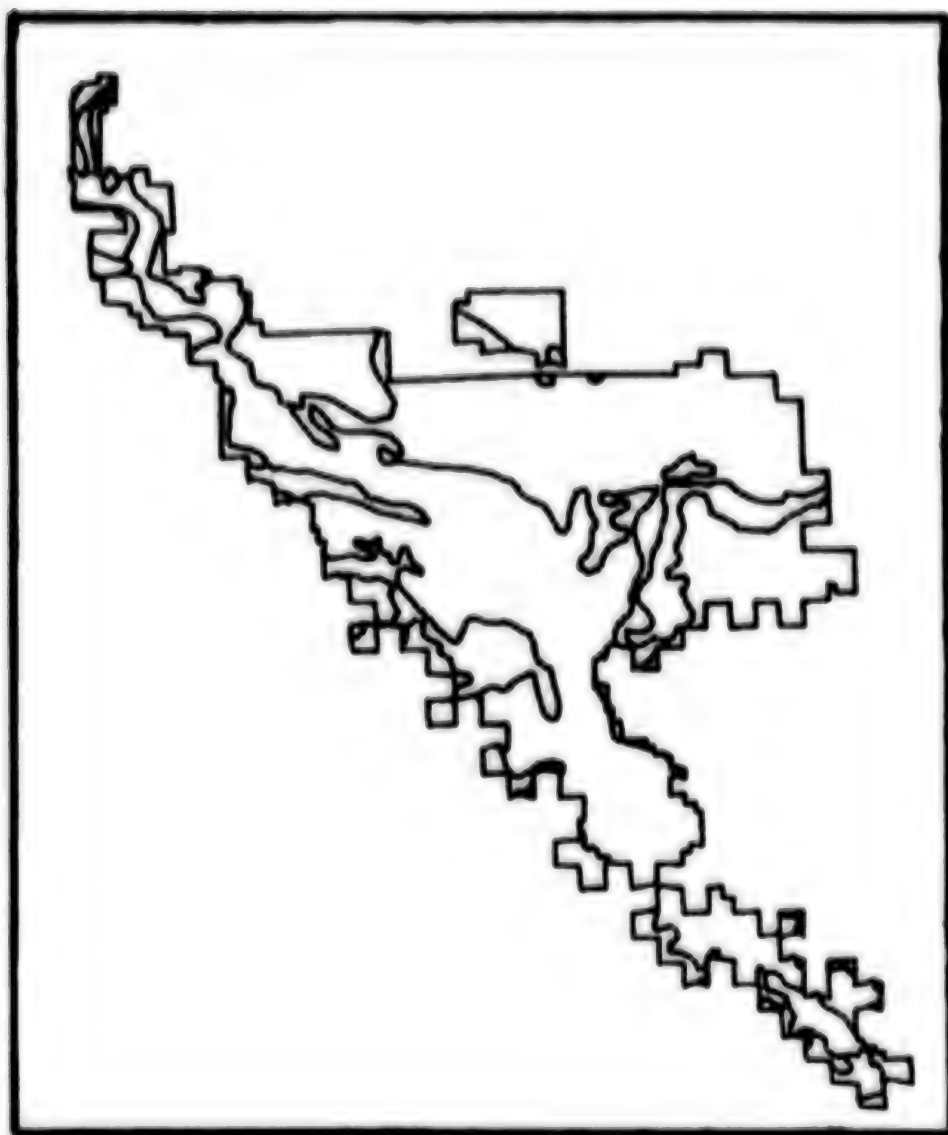


Figure 12-1. Hard copy print of digitized geology zones from the screen of a Tektronix 4051 Graphics computer terminal.

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

Soils Zones Map

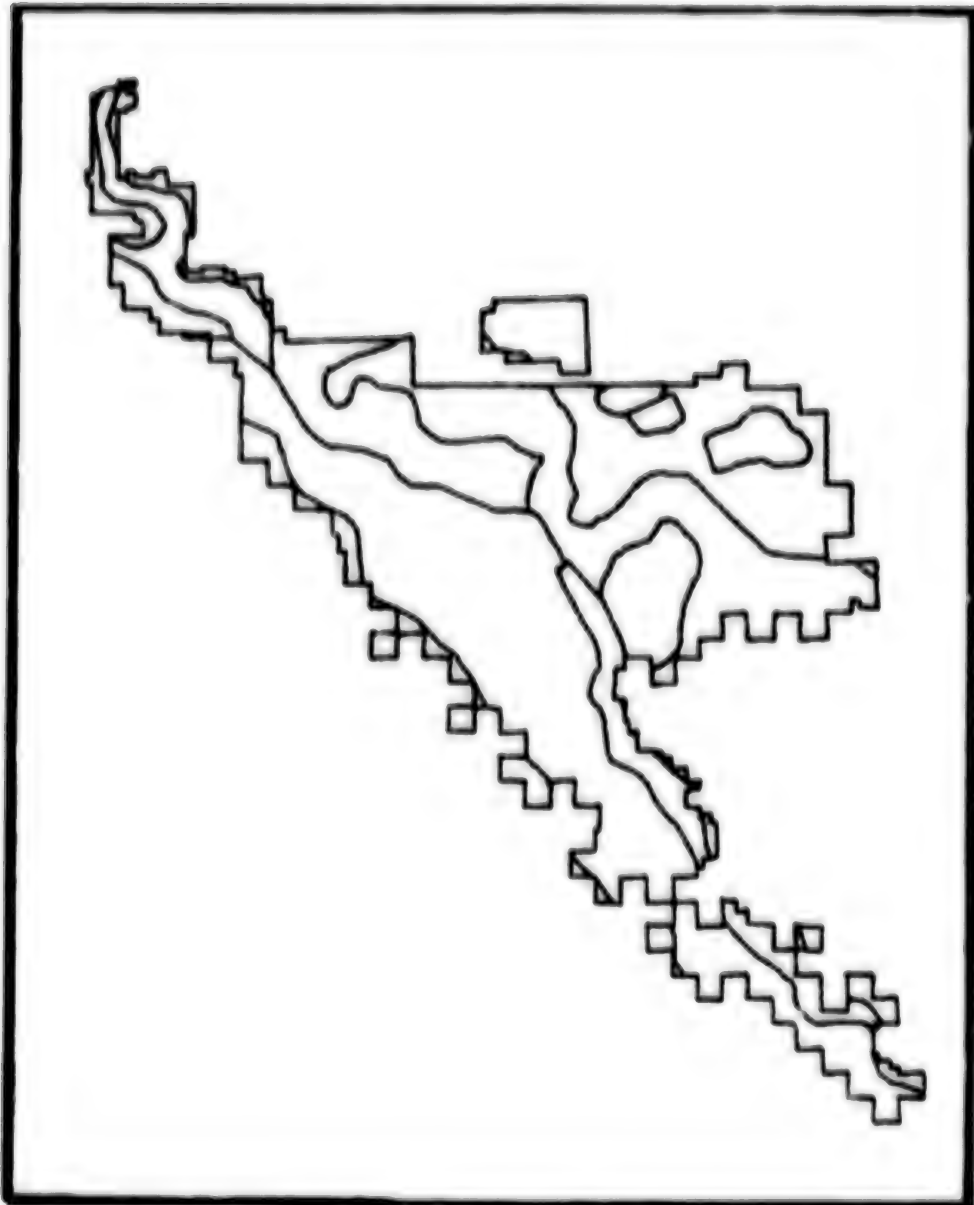


Figure 12-2. Hard copy print of digitized soils zones from the screen of a Tektronix 4051 Graphics computer terminal.

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

Geomorphology Zones Map

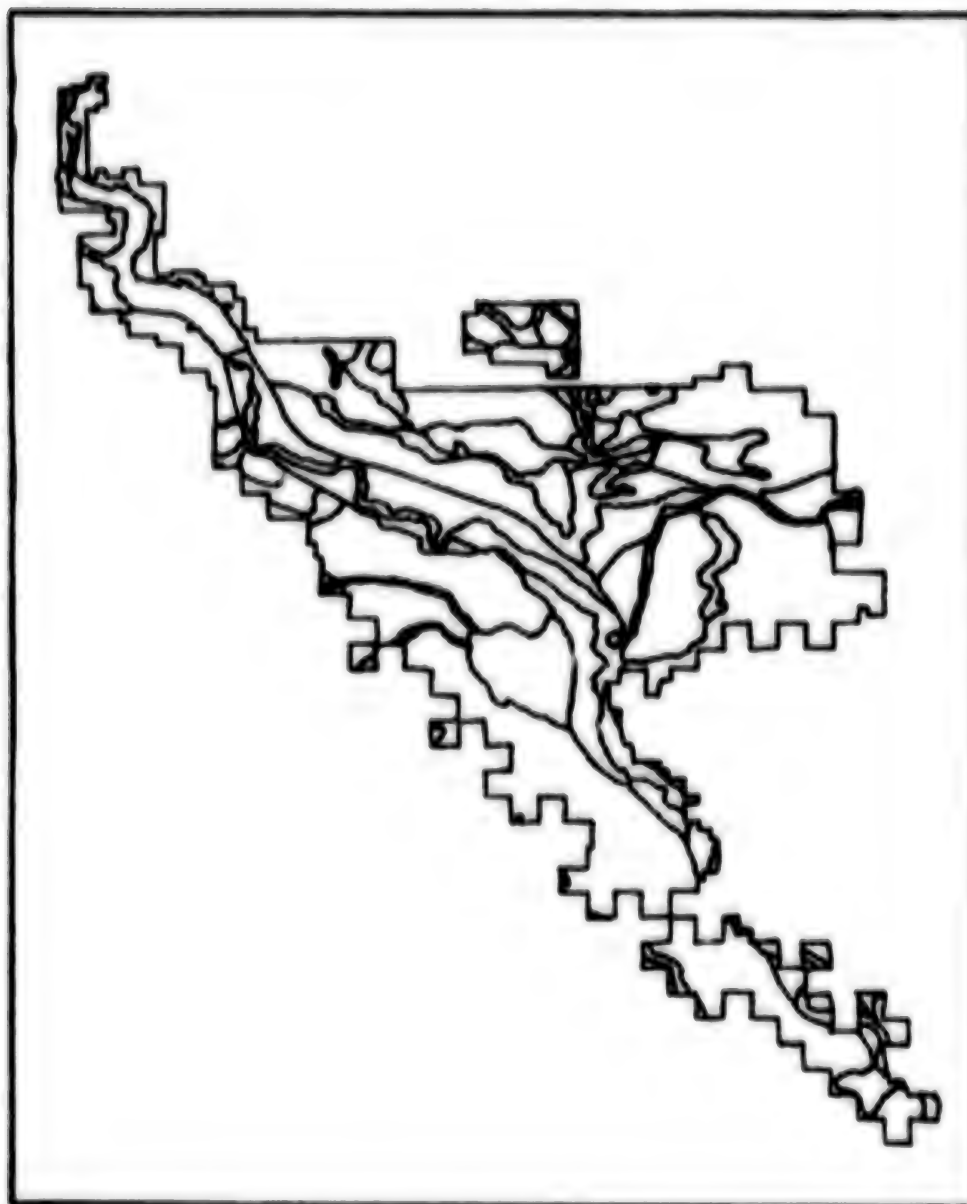


Figure 12-3. Hard copy print of digitized geomorphology zones from the screen of a Tektronix 4051 Graphics computer terminal.

PREDICTED ARCHAEOLOGICAL SITE CONCENTRATIONS



BLANK

PAGE

TABLE 12-1

ARCHAEOLOGICAL CONCENTRATIONS (SITES PER HECTARE) BY ENVIRONMENTAL ZONE

Soils Association	Palmer-Tandem soils	Non-specific Archeologic soils	Dark Archeologic soils	Medium Archeologic soils	Light Archeologic soils	All Archeologic soils	Dark Pyroclastic soils	Pyro- clastic soils	Light Pyroclastic soils	Light soils w/o pyroclastics	Light soils w/ heath w/ heath	Dark soils	Dark soils	All soils
A ₁	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
A ₂	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
V ₁	1 0.00368	1 0.00368	0 0.00000	0 0.00000	0 0.00000	1 0.00368	2 0.00736	0 0.00000	10 0.03679	12 0.04419	0 0.00000	0 0.00000	0 0.00000	24 0.08031
V ₂	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
U ₁	0 0.00000	0 0.00000	1 0.00109	2 0.00210	2 0.00210	5 0.00525	2 0.00210	1 0.00105	32 0.03361	28 0.02941	5 0.00525	0 0.00000	0 0.00000	76 0.07983
U ₂	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	4 0.03725	2 0.01862	2 0.01862	0 0.00000	0 0.00000	9 0.08381
U ₃	2 0.00084	2 0.00084	1 0.00042	5 0.00209	8 0.00334	18 0.00752	4 0.00167	1 0.00042	131 0.09473	127 0.05306	8 0.00334	1 0.00042	1 0.00042	312 0.11036
U ₄	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
U ₅	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.01154	1 0.01154	0 0.00000	0 0.00000	1 0.01154	3 0.03463	0 0.00000	0 0.00000	0 0.00000	5 0.05772
B ₁	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
V ₁	0 0.00000	0 0.00000	0 0.00000	2 0.01292	0 0.00000	2 0.01292	1 0.00446	0 0.00000	10 0.06459	8 0.05167	3 0.01938	0 0.00000	0 0.00000	27 0.17440

0 = number of sites
0.00000 = number of sites per hectare

Geologic Formation or Deposit	Palaeo- Indian sites	Non-specific Archaic sites	Early Archaic sites	Middle Archaic sites	Late Archaic sites	All Archaic sites	Late Prehistoric sites	Pre- historic sites	Native American w/ markings	Native American w/ markings	Isolated Native American	Unknown about the Native American	Unknown Prehistoric sites	Historic sites	All sites
Qal	1 0.00184	1 0.00184	0 0.00000	3 0.00552	1 0.00184	5 0.00920	2 0.00368	0 0.00000	20 0.03680	10 0.01840	4 0.00736	0 0.00000	0 0.00000	2 0.00368	44 0.08096
Tb	2 0.00070	2 0.00070	1 0.00035	4 0.00141	8 0.00282	15 0.00529	4 0.00141	2 0.00070	147 0.05185	146 0.05158	10 0.00353	1 0.00035	0 0.00000	22 0.00776	349 0.12310
Tgm	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.00040	1 0.00040	0 0.00000	0 0.00000	0 0.00000	0 0.00000	2 0.00080
Tml	0 0.00000	0 0.00000	1 0.00175	2 0.00350	2 0.00350	5 0.00874	1 0.00175	0 0.00000	20 0.03496	23 0.04020	1 0.00175	0 0.00000	1 0.00175	4 0.00680	58 0.10138
Tw	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
Tgl	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
Twe	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
Tgt	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000

Geograph. zones	Palaeo- Indian sites	Non-specta- le Arch- aic sites	Early Archaic sites	Middle Archaic sites	Late Archaic sites	All Archaic sites	Late Prehis- panic	Proto- hispanic sites	Prehis- panic w/o heathen	Classic earliest w/o heathen	Late Classic w/ heathen	Unknown about 6 Classic	Unknown Prehis- panic	Hispanic sites	All sites
T ₁	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
T ₂	0 0.00000	0 0.00000	0 0.00000	1 0.01408	0 0.00000	1 0.01408	0 0.00000	0 0.00000	5 0.07036	2 0.02815	1 0.01408	0 0.00000	0 0.00000	0 0.00000	9 0.12669
T ₃	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
T ₄	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.00613	1 0.00613	1 0.00613	0 0.00000	1 0.00613	2 0.17226	0 0.00000	0 0.00000	0 0.00000	0 0.00000	5 0.43066
P	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	3 0.01011	0 0.00000	0 0.00000	0 0.00000	0 0.00000	3 0.01011
P ₁	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.01514	1 0.01514	0 0.00000	0 0.00000	4 0.06055	4 0.06055	0 0.00000	0 0.00000	0 0.00000	0 0.00000	8 0.13624
P ₂	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.05774	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.05774
D	0 0.00000	1 0.00161	0 0.00000	1 0.00161	2 0.00322	4 0.00644	3 0.00483	0 0.00000	54 0.08698	58 0.09342	3 0.00483	1 0.00161	0 0.00000	11 0.01772	134 0.21583
D ₁	0 0.00000	0 0.00000	1 0.00860	0 0.00000	0 0.00000	1 0.00860	0 0.00000	0 0.00000	10 0.00404	9 0.07744	1 0.00860	0 0.00000	0 0.00000	0 0.00000	21 0.18069
D ₂	3 1.00182	2 0.00122	0 0.00000	6 0.00364	6 0.00364	14 0.00856	2 0.00122	0 0.00000	72 0.04373	56 0.03401	5 0.00304	0 0.00000	1 0.00061	10 0.00607	163 0.09899
A	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
H	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	13 0.06910	10 0.05315	1 0.00532	0 0.00000	0 0.00000	1 0.00532	25 0.13280
H ₂	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	2 0.00487	12 0.01922	27 0.06575	2 0.00487	0 0.00000	0 0.00000	4 0.00974	47 0.11446
H ₃	0 0.00000	0 0.00000	1 0.00201	1 0.00201	1 0.00201	3 0.00603	1 0.00201	0 0.00000	17 0.03411	7 0.01405	5 0.01003	0 0.00000	0 0.00000	2 0.00402	35 0.06822
H ₄	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.04630	0 0.00000	0 0.00000	0 0.00000	0 0.00000	1 0.04630
Res.	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000
Other	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000	0 0.00000

However, before such a comparison can be made, the derivation of the values of the artifact concentrations should be explained. Table 12-2 is a listing of the environmental zones within the Wildlife Refuge which contained sample units which were actually surveyed by Chambers' personnel. The mean, standard deviation, and standard error have been calculated for each of the six zones surveyed. The zones are arrayed from lowest average artifact concentration to highest. Table 12-3 is a listing of each of the sample units ranked in order by artifact density. A zone ranking for the various geomorphological zones has been established based on the order of the zones. That is, the first zone, zone "M", is ranked number one and is indicated by a 1 no matter where it falls on the table. The second zone, zone "M2", is ranked number two and is indicated by a 2 wherever it falls on the table. Each of the six zones is ranked this way down to the last zone, zone "F", which is indicated by the number 6.

Using the rankings shown in Table 12-3, it is possible to generate a histogram of the first, or top, twelve sample unit values, and of the second, or bottom, twelve sample unit values. Figure 12-5 shows the two histograms. There is considerable difference between the two halves of Table 12-3. A Mann-Whitney Test of Significance (see Thomas 1976 for a full discussion of the test) can be performed on this data to determine whether the relationship between geomorphological zone and artifact concentration levels could have developed by chance. Table 12-4 shows the Mann-Whitney scores for each sample unit and shows that the ranking of the geomorphologic zones by artifact density has less than a one-tenth of one percent chance of having happened by chance.

Table 12-5 is a listing of the geomorphic zones which were actually surveyed for both the greater project area and for the Bureau of Reclamation lands only and the levels of archeological materials which were found in each. It can be seen that, on the whole, there is a general correspondence between the two samples. The dune areas have higher concentrations of materials than do the mesa areas. The only real difference between the two samples is in the placement of the alluvial flats zone. In the first sample, it appears between the dunes and the mesas, and in the second sample, it contains the highest level of artifact concentration.

One interesting point is that the predictions by Ebert and Wandsnider do not seem to be borne out by the survey. It is possible that the predicted site visibility may be incorrect. However, it is also possible that the differences between Ebert and Wandsnider's predictions and what was actually found by the survey crews might be real. Areas which should have high artifact visibility but show low values of artifact concentrations might do so because the artifacts are simply not there. Conversely, areas which should have low artifact visibility but show higher than expected levels of artifact concentrations might do so because very high concentrations of artifacts occur in those zones. In other words, there may, in fact, be cultural reasons which are conditioning the distribution of the archeological record which are apparent when viewed in this manner.

RECOMMENDATIONS

Since the survey conducted in 1983 by Chambers was unable to examine sample units in each of the identified environmental strata within the project area, one of the top priorities for future survey work in the area should be to

TABLE 12-2

ARTIFACT CONCENTRATION STATISTICS BY GEOMORPHIC ZONE

<u>Zone</u>	<u>Unit Number</u>	<u>Concentration</u>	<u>Statistics</u>
M2	1	.000024	$\bar{X} = .000026$
	23	.000028	Std. Dev. = .000002828 Std. Err. = 0.10876923
M	13	.000016	$\bar{X} = .00043$
	14	.000016	Std. Dev. = .000653234
	5	.000064	Std. Err. = 1.519148837
	12	.000224	
	16	.000228	
	20	.000380	
	21	.000528	
	25	.001984	
M3	24	.000088	$\bar{X} = .000632$
	2	.001176	Std. Dev. = .000769332 Std. Err. = 1.217297468
D	26	.000724	$\bar{X} = .001766666$
	17	.000780	Std. Dev. = .001309533
	3	.001524	Std. Err. = 0.741245374
	6	.001528	
	19	.001748	
	4	.004296	
Do	7	.000060	$\bar{X} = .002868$
	10	.003760	Std. Dev. = .002485114
	8	.004784	Std. Err. = 0.86649721
F	22	.001376	$\bar{X} = .002928$
	15	.001532	Std. Dev. = .002554234
	28	.005876	Std. Err. = 0.872347677

TABLE 12-3

SAMPLE UNITS RANKED BY ARTIFACT DENSITY

<u>Density</u>	<u>Unit Number</u>	<u>Geomorphic Zone</u>	<u>Zone Ranking</u>
.000016	13	M	1
.000016	14	M	1
.000024	1	M2	2
.000028	23	M2	2
.000060	7	Do	3
.000064	5	M	1
.000088	24	M3	4
.000224	12	M	1
.000228	16	M	1
.000380	20	M	1
.000528	21	M	1
.000724	26	D	5
.000780	17	D	5
.001176	2	M3	4
.001376	22	F	6
.001524	3	D	5
.001528	6	D	5
.001532	15	F	6
.001748	19	D	5
.001984	25	M	1
.003760	10	Do	3
.004296	4	D	5
.004784	8	Do	3
.005876	28	F	6

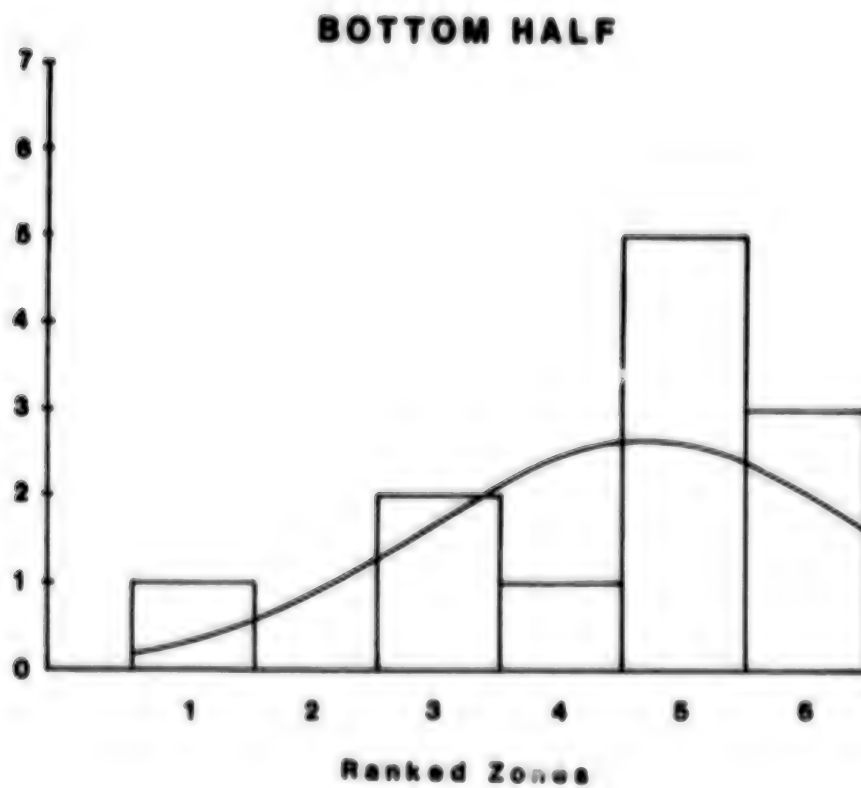
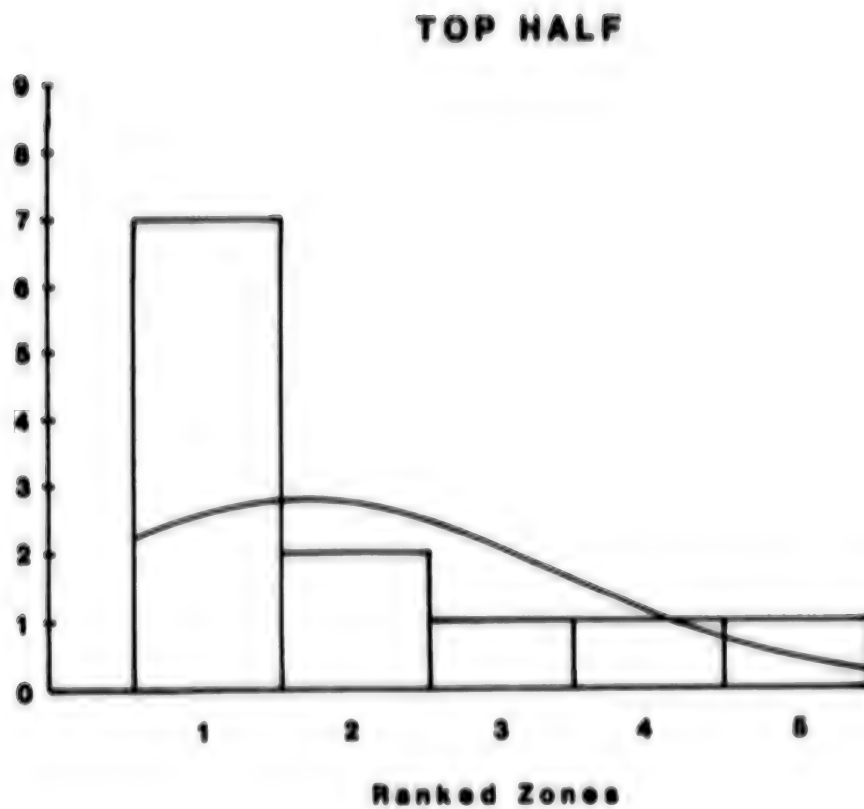


Figure 12-5. Histograms of the top and bottom halves of ranked geomorphological zones showing difference in zone distribution.

TABLE 12-4

MANN-WHITNEY TEST OF SIGNIFICANCE OF ARTIFACT DENSITY DISTRIBUTION BY GEOMORPHIC ZONES

Position of Sample	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Ranking of Zone	1	1	1	1	1	1	1	1	2	2	3	3	4	4	5	5	5	5	5	5	5	6	6	6
Top or Bottom	T	T	T	T	T	T	T	B	T	T	T	B	T	B	T	B	B	B	B	B	B	B	B	B
Score	0	0	0	0	0	0	0	0	1	1	1	0	2	0	3	0	0	0	0	0	0	0	0	0

$$U = 1 + 1 + 1 + 2 + 3$$

$$U = 8$$

Critical score of U for a One-Tailed Test at $\alpha = .001$ for $n_1 = 12$ and $n_2 = 12$ equals 20.

Scores of less than the critical score are significant (Siegel 1956, table K, pg. 274).

268

TABLE 12-5

GEOMORPHOLOGICAL ZONE RANKING BY ARCHEOLOGICAL CONCENTRATION

1st Sample (Sites/Hectare)			2nd Sample (Artifacts/Sample Unit)		
Zone	Value	Prediction	Zone	Value	Prediction
Tc	.43066	Low	F	.002928	Medium
M4	.24630	Low	Do	.002868	Medium
D	.21583	High	D	.001767	High
Do	.18069	Medium	M3	.000632	High
F	.13624	Medium	M	.000430	High
M	.13288	High	M2	.000026	Medium
T2	.12669	Low			
M2	.11446	Medium			
B	.09899	Medium			
M3	.06822	High			
F2	.05774	Medium			

obtain samples from those environmental strata not previously surveyed but which do occur within the project boundaries. The values used to create the predictive model were taken from sample data where possible. However, for those zones which had no samples recorded, data were either estimated or extrapolated. Occasionally, an arbitrarily high value would be assigned to a zone so that that zone would be dominant on the final map. The logic in doing so was that it would be better to make an area appear high in archeological materials rather than low until the area can be adequately surveyed. Since the entire project area will eventually be surveyed, such deliberate mistakes will eventually be discovered anyway.

Another recommendation for future work in the project area is for future surveys to be conducted on a staged sample approach. By continuing to sample the project area, rather than perform a linear blanket survey from one end of the area to the other, it will be possible to adjust and modify the predictive model after each field season until it agrees with the discovered data through use of a highly representative sample. Since the environmental maps of the project area have already been digitized and are on disk files at the Branch of Remote Sensing of the National Park Service, it is a fairly simple task to regenerate the predictive model with the inclusion of new data collected during each field season. Also, a staged sample survey allows the testing with each new field season of ideas regarding such aspects of field survey as variable spacing of surveyors which can be applied in future work on this or other Bureau of Reclamation projects.

REFERENCES

Beeman, Larry E.

- 1978 "Computer-Assisted Resource Management" in Integrated Inventories of Renewable Natural Resources: Proceedings of the Workshop, H. Gyde Lund, Vernon Labau, Peter F. Ffolliot, and David W. Robinson, technical coordinators. Rocky Mountain Forest and Range Experiment Station General Technical Report, RM-55. Ft. Collins, CO: US Forest Service.

Drager, Dwight L.

- 1983 "Environmental Integration in Archeology". Paper presented at the 49th Annual Meeting of the Society for American Archaeology, Portland, Oregon, April 13, 1984.

Thomas, David Hurst

- 1976 Figuring Anthropology. New York: Holt, Rinehart, and Winston.

CONCLUSIONS AND RECOMMENDATIONS

by

Dwight L. Drager

The major purpose of this project was for the Branch of Remote Sensing to draw conclusions about the distribution of cultural materials within the Bureau of Reclamation lands around the Seedskadee National Wildlife Refuge and to make recommendations regarding how future archeological survey in the area should be performed.

To meet the requirements of existing federal legislation dealing with existing properties on the National Register of Historic Places, the Branch has identified and recoded in the format allowing comparison with all sites in or near the area the three known sites currently listed on the National Register. This information, along with all information currently available from the Wyoming State Historic Preservation Office, is provided as a separate article within this report (see Drager, "National Register Sites . . .", this volume). The prehistoric sites found by the summer 1983 survey by Chambers Planners and Consultants have all been recommended for nomination to the National Register on the basis that they might contain information valuable to future research within the area. At this time, the Branch of Remote Sensing would recommend that actual nomination of those particular areas be delayed until the entire Bureau of Reclamation land holdings around the Seedskadee National Wildlife Refuge has been examined. It is possible that other areas within those land holdings may contain more significant materials and might be determined to be better examples of the types of sites found in this area. The Bureau of Reclamation may then choose to be selective about the sites or areas it wishes to nominate, rather than simply nominating all the areas examined by a single survey.

The materials presented to develop a predictive model of archeological site concentrations on the Bureau's land holdings demonstrate that the discovery of archeological materials is conditioned by the the surface conditions of the ground. It is still impossible to say whether materials are found in one environmental zone as opposed to another because they occur in higher concentrations there or because they are more visible there. However, it has been demonstrated that differences in concentrations do occur.

The distance of spacing between members of a survey crew used during the 1983 survey assures that that survey was one of the most intense surveys ever conducted in this portion of Wyoming, and possibly anywhere in the United States. The rate of recovery of materials and the degree of recording and field analysis were unprecedented in the field of cultural resource management and only the most exceptional archeological research projects have collected as much information and rarely in as short a time period.

There was, however, a major trade-off for this massive data collection effort. The cost per acre of conducting the field survey, data collection, and field analysis is approximately \$25. If an additional amount is included to pay for report preparation and minimal laboratory manipulation of the field-collected

data, the cost approaches \$30 per acre. Both these figures exceed the costs most federal agencies are willing to invest in the collection of archeological information from field surveys.

It must, however, be pointed out that the extra investment does buy extra products. Three Ph.D. dissertations are already being prepared from the information collected during this project. Undoubtedly, others will be also. The data collected by this project already has, and will continue to, demonstrate new and important information to both archeological methods and theories for years to come. Methodologically, it has been demonstrated that it is possible to piece plot individual artifacts and to perform field analysis on them at rates that are no slower than traditional survey procedures. It appears that the most significant factor weighing on the actual performance of a survey is sun angle. Surveyors should try to direct their transects so that they are not casting shadows into their line of vision if their primary objective is the location of lithic scatters. Also, distractions such as insects can be major problems on surveys. However, factors such as time of day, direction of transect, closeness to lunch or quitting time, and others, seem to have little to no effect on the ability of a professional survey crew to perform discovery survey. Theoretically, this project has demonstrated that former ideas about the existence of archeological sites and areas where sites do not occur, may be somewhat naive. When intense archeological survey is undertaken, archeological materials will be found. They may not always be in the forms that many archeologists would traditionally have called sites (e.g., they may be very dispersed scatters of materials), but the materials are there and can be found. Ideas about where people did and did not perform activities may very well have to be changed. This project has demonstrated that people use all the surface of an area; they merely use some portions of it more intensively.

One extremely important methodological discovery of this project is the demonstration that archeologists do not find all materials within an area and that the ones they do find are conditioned by whether they have found others nearby. This has implications for both archeological methodology and theory. If archeologists are aware that they are missing isolated materials, it may be possible to train them to look carefully in all areas, whether other materials have been found nearby or not. Also, if the traditional concept of an archeological site can be shed, there is no reason to expect archeological materials to occur in close proximity to other archeological materials.

Other specific recommendations addressed in the individual reports of this project should be taken into consideration when planning the continuing survey of the Bureau of Reclamation lands around the Seedskadee National Wildlife Refuge. Since this portion of the project generated base maps of the entire project area, obviously those maps should be used during future survey. Since certain environmental zones were not surveyed during this preliminary sample, those zones should be among the first areas examined during future survey. Since a predictive model of the archeological concentrations of the area has been made, that model should be tested and extended when new data become available. All the materials collected during this portion of the examination of the Seedskadee area including maps, descriptions, survey reports, site forms, projectile point typologies, and artifactual data can and should be used by future contractors performing survey on those Bureau of Reclamation lands in the Seedskadee area.

SEEDSKADEE PROJECT

Bibliographic References

Since the Seedskadee Project Area is considered by many to lie at the interface of two archeological provinces, Basin and Range and High Plains, this listing contains archeological references pertinent to both provinces as well as geological, hydrological, climatological, floral, and faunal entries directly related to Wyoming in general and southwestern Wyoming in particular.

Adams, J., and J. Mack

1970 A report of 488W303. The Wyoming Archaeologist, 13(2).

Adams, William Y., Alexander J. Lindsay, Jr., and Christy G. Turner II

1961 Survey and excavations in Lower Glen Canyon, 1952-1958. Museum of Northern Arizona Bulletin, No. 36, Glen Canyon Series, No. 3. Flagstaff.

Adovasio, James H.

1970 The origin, development and distribution of Western Archaic textiles. Tubiwa, 13(2):1-40. Pocatello.

Agenbroad, Larry D.

1973 The Hudson-Meng Paleo-Indian bison kill. Northwestern Nebraska: An analysis after two field seasons. Paper presented at the Thirty-eighth Annual Meeting of the Society for American Archaeology at San Francisco.

1974a The Hudson-Meng Site: An Alberta bison kill in the Nebraska High Plains. Paper presented at the Thirty-second Annual Plains Conference at Laramie, Wyoming.

1974b Results of the third field season: Hudson-Meng Paleo-Indian bison kill, northwestern Nebraska. Paper present at the Thirty-ninth Annual Meeting of the Society for American Archaeology at Washington, D.C.

1978a Cody Knives and the Cody Complex in Plains prehistory: A re-assessment. Plains Anthropologist, 23(86):159-161.

1978b The Hudson-Meng site: An Alberta bison kill in the Nebraska High Plains. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

1978c Buffalo jump complexes in Owyhee County, Idaho. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Agogino, George A.

1961 A new point type from Hell Gap Valley, eastern Wyoming. American Antiquity, 26(4):558-560.

1962 The Leath skeletal material. Wyoming Archeologist, 5(2):7-8.

1964 Recent progress at the Clovis Site, New Mexico. Oklahoma Anthropological Society Newsletter, 12(8):5-6.

1972 Excavations at a Paleo-Indian site (Brewster) in Moss Agate Arroyo, eastern Wyoming. National Geographic Society Research Reports 1955-1960:1-6.

Agogino, George A., and W. D. Frankforter

1960 The Brewster site: An Agate Basin Folsom Complex multiple component site in eastern Wyoming. Masterkey, 34(3):102-107.

Agogino, George A., and Eugene Galloway

1963 The skulls from Torrington, Wyoming: A re-evaluation. American Antiquity, 29(1):106-109.

1965 The Slater's Hill site: A Hell Gap site in north-central Wyoming. Plains Anthropologist, 10(29):190-195.

Ahlbrandt, Thomas S.

1974 Dune Stratigraphy, Archaeology, and the Chronology of the Killpecker Dune Field. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, 10:52-60.

Aikens, C. Melvin

1965 Excavations in Southwest Utah. University of Utah Anthropological Papers, No. 76, Glen Canyon Series, No. 27. Salt Lake City.

1966a Excavations at Snake Rock Village and the Bear River No. 2 Site. Manuscript on file, Department of Anthropology, University of Utah. Salt Lake City.

1966b Virgin-Kayenta Cultural Relationships. University of Utah Anthropological Papers, No. 79. Salt Lake City.

1966c Plains relationships of the Fremont and the Promontory cultures: A hypothesis. Unpublished manuscript, Department of Anthropology, University of Utah. Salt Lake City.

1966d Fremont-Promontory-Plains relationships: Including a report of excavations at the Injun Creek and Bear River Number 1 Sites, northern Utah. University of Utah Anthropological Papers, No. 82. Salt Lake City.

1966e Excavations at a Fremont bison butchering site in northern Utah. Unpublished manuscript, Department of Anthropology, University of Utah. Salt Lake City.

1967 Excavations at Snake Rock Village and the Bear River No. 2 Site. University of Utah Anthropological Papers, No. 87. Salt Lake City.

1970 Hogup Cave. University of Utah Anthropological Papers, No. 93. Salt Lake City.

Albanese, John P.

1970 Geology of the Glenrock site area, Wyoming. In The Glenrock Buffalo Jump, 48C0304: Late Prehistoric Period Buffalo Procurement and Butchering. George C. Frison, ed. Plains Anthropologist Memoir, No. 7, Appendix III.

1971 Geology of the Ruby site area, Wyoming, 48CA302. American Antiquity, 36(1):91-95.

- 1972 Paleotopography and Paleo-Indian sites in Wyoming and Colorado. The Museum Journal, XVII:28-47. Lubbock: West Texas Museum Association, Texas Tech University.
- 1974a Geology of the Casper archeological site. In The Casper Site: A Hell Gap Bison Kill on the High Plains. George C. Frison, ed. New York: Academic Press.
- 1974b Geology of the Casper Archeological site, Natrona County, Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- 1975 Paleotopography of Paleo-Indian sites in the Northern Great Plains. Paper presented at the Paleo-Indian Lifeways Symposium at Texas Tech Museum, Lubbock.
- 1978a Archeogeology of the Northwestern Plains. In Prehistoric Hunters of the High Plains. George C. Frison. Appendix 1, pp. 375-389. New York: Academic Press.
- 1978b Paleotopography and bison traps. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- n.d.a Geology of the Hanson site, Bighorn County, Wyoming. In preparation.
- n.d.b Geology of the Jones-Miller site, Yuma County, Colorado. In preparation.
- n.d.c Reconnaissance Quaternary geology of the Bureau of Reclamation withdrawal area, Fremont County, Wyoming. Unpublished report prepared for the Wyoming State Archaeologist's Office.
- Albanese, John P., and Michael Wilson
 1974 Preliminary description of the terraces of the North Platte River at Casper, Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- Allen, James B., and Glen M. Leonard
 1976 The Story of the Latter-Day Saints. Salt Lake City: Deseret Book Co.
- Alley, Harold P., and Gary A. Lee
 1979 Weeds of Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, No. 498.
- Ambler, J. Richard
 1966 Caldwell Village and Fremont Prehistory. Ph.D. dissertation, University of Colorado. Boulder.

- Anderson, Duane C., and Richard Shutler, Jr.
 1978 The Cherokee Sewer site (13CK405): A summary and assessment. In *Bison Procurement and Utilization: A Symposium*. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- Anderson, Elaine
 1968 Fauna of the Little Box Elder Cave, Converse County, Wyoming. The Carnivora. University of Colorado Studies, Series in Earth Sciences, 6:1-59.
 1974 A survey of late Pleistocene and Holocene mammal fauna of Wyoming. In *Applied Geology and Archaeology: The Holocene History of Wyoming*. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- Andrews, Janet
 1972 The Paleopathology of the Eastern Great Basin Fremont Population. Master's thesis, Department of Anthropology, University of Utah. Salt Lake City.
- Andrews, J. T., and P. J. Webber
 1974 A review of lichenometry and the dating of weathered rock surfaces in the High Cordillera. In *Applied Geology and Archaeology: The Holocene History of Wyoming*. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- Angulski, D., J. Bleacher, P. Sanders, D. Reiss, G. C. Tucker, R. O. Lewis, and S. Miller
 1982 Final report on 1981 Investigations at Sites along MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, Spread 6, Lincoln, Sweetwater, and Uinta Counties, Wyoming. H. D. Metcalf, ed. In preparation for Woodward-Clyde by Pioneer/Metcalf-Zier.
- Antevs, Ernst
 1948 Climatic changes and pre-White man. The Great Basin, with Emphasis on Glacial Times and Postglacial Times. Bulletin of the University of Utah, 38(20), Biological Series, 10(7):168-191. (reprinted 1974).
 1950 Postglacial Climatic History of the Great Plains and Dating the Records of Man. In *Proceedings of the Sixth Plains Archeological Conference, 1948*. Jesse D. Jennings, ed. University of Utah Anthropological Papers, 11:46-50. Salt Lake City.
 1955 Geologic-Climatic Dating in the West. American Antiquity, 20(4):317-335.
- Armitage, C. Lawrence, Steven D. Creasman, and J. C. Mackey
 1982 The Deadman Wash Site: A Multi-Component (Paleo-Indian, Archaic, Late Prehistoric) Site in Southwestern Wyoming. Journal of Intermountain Archaeology, 1(1):1-10.

Arrington, Leonard J.

- 1958 Great Basin Kingdom: Economic History of the Latter-Day Saints.
Cambridge: Harvard University Press.

Arthur, George W.

- 1960 Pictographs in central Montana, Part III. Montana State University
Sociology and Anthropology Papers, 21:41-44.
- 1962 The Emigrant Bison Drives of Paradise Valley, Montana. In Symposium on
Buffalo Jumps. Carling Malouf and Stuart Connor, eds. Montana
Archaeological Society Memoir, 1:16-27.
- 1966 An archeological survey of the Upper Yellowstone River drainage, Montana.
Montana State University, Agricultural Economics Research Report, No. 26.
- 1975 An Introduction to the Ecology of Early Historic Communal Bison Hunting
among the Northern Plains Indians. Ottawa: National Museum of Canada.
- 1978 A re-analysis of the early historic Plains Indian bison drives. In Bison
Procurement and Utilization: A Symposium. Leslie B. Davis and Michael
Wilson, eds. Plains Anthropologist Memoir, No. 14.

Aschmann, Homer H.

- 1958 Great Basin Climates in Relation to Human Occupance. Current Views on
Great Basin Archaeology. Reports of the University of California
Archaeological Survey, 42:23-40. Berkeley.

Athearn, Robert G.

- 1971 Union Pacific Country. New York: Rand McNally.

Baldwin, Gordon C.

- 1950 The pottery of the Southern Paiute. American Antiquity, 16(1):50-55.

Barbour, E. H., and C. Bertrand Schultz

- 1932 The Scottsbluff bison quarry and its artifacts. Nebraska State Museum,
Bulletin, No. 34.

Barnes, Paul L.

- 1964 Archaeology of the Dean site: Twin Falls County, Idaho. Laboratory of
Anthropology, Division of Archaeology and Geochronology, Report of
Investigations, No. 25. Pullman: Washington State University.

Bartlette, Katherine L.

- 1943 A primitive stone industry in the Little Colorado Valley, Arizona.
American Antiquity, 8(3):266-268.

Bass, William M.

- 1970 Excavations of a Paleo-Indian site at Agate Basin, Wyoming. National Geographic Society Research Reports, 1961-1962:21-25.

Bass, William M., and Donald C. Lacy

- 1963 Three human skeletons from the PK burial, Sheridan County, Wyoming. Plains Anthropologist, 8(21):142-157.

Baumhoff, M. A., and J. S. Bryne

- 1959 Desert side-notched points as a time-marker in California. University of California Archaeological Survey, 48:32-65.

Baumhoff, Martin A., and Robert F. Heizer

- 1965 Postglacial Climate and Archeology in the Desert West. In The Quaternary of the United States, Part I: Geology. H. E. Wright, Jr., and David G. Frey, eds. Princeton: Princeton University.

Becker, Clarence F., and John D. Alyea

- 1964a Temperature probabilities in Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, No. 415.

- 1964b Precipitation probabilities in Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, No. 416.

Becker, Clarence F., Larry Pochop, and John D. Alyea

- 1977 Probabilities of freeze in Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, 381R.

Bedord, Jean Newman

- 1974 Morphological variation in bison metacarpals and metatarsals. In The Casper Site: A Hell Gap Bison Kill on the High Plains. George C. Frison, ed. New York: Academic Press.

- 1978 Techniques for sex determination of mature bison metapodials. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Bedwell, S. F.

- 1970 Prehistory and Environment of the Pluvial Fort Rock Lake Area of South Central Oregon. Ph.D. dissertation, University of Oregon. Eugene.

Beetle, Alan A.

- 1970 Recommended Plant Names. University of Wyoming Agricultural Experiment Station Research Journal, No. 31.

1974 Holocene Changes in Wyoming Vegetation. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

1977 Grasses of Wyoming. University of Wyoming Agricultural Experiment Station Research Journal, No. 39R.

Beetle, Alan A., and Kendall L. Johnson

1982 Sagebrush in Wyoming. University of Wyoming Agricultural Experiment Station, B-779.

Bell, Robert E.

1958 Guide to the identification of certain American Indian projectile points. Oklahoma Anthropological Society, Special Bulletin, No. 1. Oklahoma City.

Benedict, James B.

1975 The Murray site: A Late Prehistoric game drive system in the Colorado Rocky Mountains. Plains Anthropologist, 20(69):161-174.

Benedict, James B., and B. L. Olson

1973 Origin of the McKean Complex: Evidence from timberline. Plains Anthropologist, 18(62, 1-2):323-327.

1978 The Mount Albion Complex: A study of prehistoric man and the Althithermal. Center for Mountain Archaeology, Research Report, No. 1.

Bentzen, Raymond C.

1961 The Powers-Yonkee Bison Trap, 24PR5. Report of the Sheridan Chapter, Wyoming Archaeological Society.

1962 The Mavrakis-Bentzen-Roberts Bison Trap, 48SH311. Report of the Sheridan Chapter, Wyoming Archaeological Society.

1963 The Bentzen-Little Bald Mountain Site. Plains Anthropologist, 8(19):41-51.

Berry, Michael S.

1972 The Evans Site. Special Report, Department of Anthropology, University of Utah (limited distribution). Salt Lake City.

1975 Sketch of Western Uinta Basin Prehistory with Emphasis on Utah Oil-Shale Lands. In Tri-State Oil Shale Region Cultural Resource Inventory Plan. (by J. J. Hester, K. Pernell, M. S. Berry, M. Miller, N. Frost, C. H. Jennings, and B. Leonard). Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.

Birkby, Walter H., and William M. Bass

1963 Possible Shoshonean skeletal material from the Turk Burial site, 48WA301. Plains Anthropologist, 8(20):103-114.

Blackstone, D. L., Jr.

- 1951 An essay on the development of structural geology in Wyoming. Wyoming Geological Association Sixth Annual Field Conference Guidebook. Casper.

Blackwelder, Eliot

- 1950 Pleistocene Geology, the Green River Basin, Wyoming. Wyoming Geological Association, Fifth Annual Field Conference, Southwestern Wyoming, Guidebook, pp. 81-85. Casper: Kintzel Blue Print Co.

Blair, William C.

- 1949 Additional data on crania from the Warren Mounds, Utah. American Antiquity, 14(3):224-225.

Bleacher, J., and D. Angulski

- 1981 Monitoring Report on MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, Spread 6, Lincoln, Sweetwater, and Uinta Counties, Wyoming. M. D. Metcalf and J. L. Anderson, eds. Prepared for Woodward-Clyde by Pioneer/Metcalf-Zier, and submitted to the Bureau of Land Management, Wyoming.

Bleacher, J., S. Nelson, and S. Brock

- 1982 Archaeological Inventory of MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, Spread 6, Lincoln, Sweetwater, and Uinta Counties, Wyoming. M. D. Metcalf and J. L. Anderson, eds. In preparation for Woodward-Clyde by Pioneer/Metcalf-Zier.

Bliss, Wesley L.

- 1950a Birdhead Cave, a stratified site in the Wind River Basin, Wyoming. American Antiquity, 15(3):187-196.

- 1950b Early and late lithic horizons in the Plains. In Proceedings of the Sixth Plains Archeological Conference, 1948. Jesse D. Jennings, ed. University of Utah Anthropological Papers, 11:108-116.

Bonham, Charles D.

- 1977 Vegetation Inventory South Block Kemmerer Coal Company, Lincoln County, Wyoming. Fort Collins, CO: Front Range Lab, Inc.

Bradley, Wilmot H.

- 1936 Geomorphology of the North Flank of the Uinta Mountains. USGS Professional Paper, 185-1:161-204.

- 1964 Geology of the Green River Formation and Associated Eocene Rocks in Southwestern Wyoming and Adjacent Parts of Colorado and Utah. USGS Professional Paper, 496-A.

Breckenridge, Roy

- 1974 The use of archaeology in dating Quaternary deposits in the Upper Wood River area, Absaroka Range, Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Breternitz, David A.

- 1966 An Appraisal of Tree-ring Dated Pottery in the Southwest. Anthropological Papers of the University of Arizona, No. 10.
- 1971 Archaeological investigations at the Wilbur Thomas Shelter, Carr, Colorado. Southwestern Lore, 36(4):53-99.

Breternitz, David A. (ed.)

- 1970 Archaeological Excavations in Dinosaur National Monument, Colorado-Utah, 1964-1965. University of Colorado Studies, Series in Anthropology, No. 17. Boulder.

Breternitz, David A., Alan C. Sweetlund, and Duane C. Anderson

- 1971 An early burial from Gordon Creek, Colorado. American Antiquity, 36(2):170-182.

Brew, John O.

- 1946 Archaeology of Alkali Ridge, Southeastern Utah. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 21. Cambridge, MA.

Bright, Robert C.

- 1966 Pollen and Seed Stratigraphy of Swan Lake, Southeastern Idaho; Its Relation to Regional Vegetational History and to Lake Bonneville History. Tebiwa, 9(2):1-47.

Brose, David S.

- 1975 Functional analysis of stone tools: A cautionary note on the role of animal fats. American Antiquity, 40(1):86-94.

Brown, Barnum

- 1932 The buffalo drive. Natural History, 32(1):75-82.

Brown, G. M.

- 1978 Archaeological Survey and Testing on the Stauffer Moxa Arch Pipeline. The Opal Bench Study Area, Lincoln County, Wyoming. Western Wyoming College, Occasional Papers, No. 16.

Brown, Kenneth L.

- 1979 Late prehistoric settlement patterns in southwestern Kansas. Plains Anthropologist, 24(85):191-206.

Brown, Lionel A.

- 1963 The Fort Smith Medicine Wheel, Montana. Plains Anthropologist, 8(22):225-230.

Brox, G., and M. Miller

- 1974 The John Gale site 48CR303: A preliminary report. Wyoming Archaeologist, 17:13-26.

Brumley, John H.

- 1973 Quantitative methods in the analysis of butchered faunal remains: A suggested approach. Archaeology in Montana, 14(1):1-40.
- 1978 McKean Complex subsistence and hunting strategies in the southern Alberta Plains. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Bryan, Kirk

- 1950 Flint quarries--the source of tools and, at the same time, the factories of the American Indian. Papers of the Peabody Museum of American Archaeology and Ethnology, 17(13). Cambridge, MA.

Bryan, Kirk, and L. L. Roy

- 1970 Geologic Antiquity of the Lindenmeier Site in Colorado. Smithsonian Miscellaneous Collections, 99(2).

Bryson, Reed, David A. Barreis, and Wayne M. Wendlund

- 1970 The character of late-Glacial and post-Glacial climatic changes. Pleistocene and Recent Environments of the Central Great Plains. Wakefield Dort, Jr., and Knox Jones, Jr., eds. University of Kansas Special Publication, No. 3.

Buckles, William G.

- 1964 An analysis of primitive rock art at Medicine Creek Cave, Wyoming, and its cultural and chronological relationships to the prehistory of the Plains. Master's thesis, University of Colorado. Boulder.

Burgh, Robert F., and Charles R. Scoggins

- 1948 The Archaeology of Castle Park, Dinosaur National Monument. University of Colorado Studies, Series in Anthropology, No. 2.

Burma, Benjamin H.

- 1950 Erosion and Sedimentation in the Great Plains: A Criticism of Dr. Antevs' Conference Papers. In Proceedings of the Sixth Plains Archeological Conference, 1948. Jesse D. Jennings, ed. University of Utah Anthropological Papers, 11:52-55.

Burpee, L. J. (ed.)

- 1910 Journal of Larocque from the Assiniboine to the Yellowstone, 1805. Canadian Archives Publication, No. 3. Ottawa.

Butler, B. Robert

- 1962 Contributions to the Prehistory of the Columbian Plateau. Occasional Papers of the Idaho State College Museum, No. 9. Pocatello.
- 1963 An early man site at Big Camas Prairie, south-central Idaho. Tebiwa, 6(1):22-34.
- 1964 A recent early man point find in south-eastern Idaho. Tebiwa, 7(1):39-40.
- 1965a A report on investigations on an early man site near Lake Channel, southern Idaho. Tebiwa, 8(2):1-20.
- 1965b The structure and function of the Old Cordilleran culture concept. American Anthropologist, 67(2, pt. 5):1120-1131.
- 1966 A guide to understanding Idaho archaeology. Special Publication of the Idaho State University Museum. Pocatello.
- 1967 More Haskett point finds from the type locality. Tebiwa, 10(1):25.
- 1968 An introduction to archaeological investigations in the Pioneer Basin Locality of eastern Idaho. Tebiwa, 11(1):1-30.
- 1970a A surface collection from Coyote Flat, southeastern Oregon. Tebiwa, 13(1):34-57.
- 1970b A report on the 1967-1969 archaeological survey of the National Reactor Testing Station, Idaho. Tebiwa, 13(3):58-75.
- 1971a A bison jump in the Upper Salmon River Valley of eastern Idaho. Tebiwa, 14(1):4-32.
- 1971b The Wasden site bison: Sources of morphological variation. Aboriginal Man and Environments on the Plateau of Northwest America. Arnoud H. Stryd and Rachel A. Smith, eds. Calgary Archaeological Association, University of Calgary.
- 1978 Bison hunting in the Desert West before 1800: The paleo-ecological potential and the archaeological reality. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Butzer, Karl W.

1971 Environment and Archeology: An Ecological Approach to Prehistory. Second edition. Chicago: Aldine-Atherton, Inc.

1974 Geological and ecological perspectives of the middle Pleistocene. Quaternary Research, 4(2):136-148.

Calef, W., N. Lackey, J. Trotter, R. Lamb, and J. Wray

1957 Winter weather type frequencies, northern Great Plains. Quartermaster Research and Engineering Command Technical Report EP-64. Natick, MA: U.S. Army.

Callen, Eric O., and Paul S. Martin

1969 Plant remains in some coprolites from Utah. American Antiquity, 34(3):329-331.

Campbell, John W.

1956 A Folsom site in Idaho. Plains Anthropologist, 6(4):1-2.

Carter, George F.

1945 Plant Geography and Culture History in the American Southwest. Viking Fund Publications in Anthropology, No. 5. New York.

Cary, Merritt

1917 Life Zone Investigations in Wyoming. North American Fauna, No. 42.

Caywood, Louis R.

1948 Yuma point from western Idaho. American Antiquity, 13(3):251.

Chamberlin, R. V.

1911 The Ethno-botany of the Goshute Indians of Utah. American Anthropological Association Memoirs, 2(5):329-405.

Champe, John L.

1946 Ash Hollow Cave. University of Nebraska Studies, n.s., No. 1.

1949 White Cat Village. American Antiquity, 14(4, pt. 1):285-292.

Chase, James E., and Calvin H. Jennings

1978 Archaeological site location: A predictive methodology. Paper presented at the Thirty-seventh Annual Plains Conference, Denver.

Chisohn, James

1960 South Pass, 1868, James Chisohn's Journal of the Wyoming Gold Rush. Lolan Homsher, ed. Lincoln: University of Nebraska Press.

Chittenden, Hiram M., and Alfred T. Richardson (eds.)

1905 Life, Letters, and Travels of Father Pierre-Jean Smet, O. J., 1801-1873. New York: F. P. Harper.

Clark, Tim W.

1975 Some relationships between prairie dogs, black-footed ferrets, Paleo-Indians, and ethnographically known tribes. Plains Anthropologist, 20(67):71-74.

Clayton, James L.

1967 The growth and economic significance of the American fur trade, 1790-1890. Aspects of the Fur Trade. St. Paul: Minnesota Historical Society.

Clewlow, G. William, Jr.

1967 Time and Space Relationships of Some Great Basin Projectile Point Types. Reports of the University of California Archaeological Survey, 70:141-149.

Coale, George L.

1963 A study of Shoshonean pottery. Tebiwa, 6(2):1-11.

Collins, Don D.

1969 Macroclimate and the grasslands ecosystem. The Grassland Ecosystem: A Preliminary Synthesis. R. A. Dix and G. R. Beidelman, eds. Pp. 29-39. Fort Collins: Range Science Department, Colorado State University.

Connor, Stuart W.

1962a A preliminary survey of prehistoric picture writing on rock surfaces in central and south-central Montana. Anthropological Paper of the Billings Archaeological Society, No. 2.

1962b Unusual characteristics of the Keogh Buffalo Jump. In Symposium on Buffalo Jumps. Carling Malouf and Stuart W. Connor, eds. Montana Archaeological Society Memoir, 1:8-11.

Coues, Eliot (ed.)

1898 Forty Years a Fur Trapper on the Upper Missouri: The personal narrative of Charles Larpenteur, 1833-1872. New York: F. P. Harper.

Coupland, Robert T.

1958 The effects of fluctuations in weather upon the grasslands of the Great Plains. The Botanical Review, 24:274-317.

Coutant, C. G.

1899 The History of Wyoming from the earliest known Discoveries. Laramie: Chaplin, Spafford, and Mathison. (reprinted 1966, New York: University Microfilms, Argonaut Press).

- Cowrie, James E.
1957 The areal distribution of the Eastern Shoshone. Master's thesis, Department of Anthropology, University of Colorado, Boulder.
- Crabtree, Don E., and B. Robert Butler
1964 Notes on experiments in flint knapping: 1 heat treatment of silica materials. Tebiwa, 7(1):1-6.
- Cressman, Steven D.
1981 Archaeological investigations in the Canyon Pintado Historic District, Rio Blanco County, Colorado. Reports of the Laboratory of Public Archaeology, No. 34.
- Cressman, Steven D., Janice C. Hawberry, Patricia A. Treat, Herbert Rodriguez, and Ronald E. Kainer
1981 Cultural Resource Investigations of the Desert Springs West Loop (58) Pipeline. Rock Springs: Archaeological Services, Western Wyoming College.
- Cressman, L. S.
1960 Cultural sequences at the Dalles, Oregon: A contribution to Pacific Northwest prehistory. Transactions of the American Philosophical Society, 50(10).
- Cressman, L. S., and Alex D. Krieger
1940 Atlatic and associated artifacts from south-central Oregon. In Early Man in Oregon: Archaeological Studies in the Northern Great Basin. University of Oregon Monographs, Studies in Anthropology, 3:16-52.
- Cressman, L. S., and Howell Williams
1940 Early man in south-central Oregon: Evidence from stratified sites. In Early Man in Oregon: Archaeological Studies in the Northern Great Basin. University of Oregon, Studies in Anthropology, 3:52-75.
- Crouse, Hubert Y.
1954 A Folsom point from the Uinta Basin, Utah. The Masterkey, 28(2):50-51.
- Curtis, Bruce F.
1951 Summary of the Mesozoic stratigraphy of south-central Wyoming. Wyoming Geological Association Sixth Field Conference Guidebook. Casper.
- Dale, Harrison C.
1918 The Ashley-Smith Explorations and the Discovery of a Central Route to the Pacific, 1822-1829. Cleveland: Arthur C. Clark.

Dalley, Gardiner F.

- 1970 Faunal remains. In Median Village and Fremont Culture Regional Variation. John P. Harvitt, ed. University of Utah Anthropological Papers, 95:127-133. Salt Lake City.
- 1976 Swallow Shelter and Associated Sites. University of Utah Anthropological Papers, No. 96. Salt Lake City.

Dalley, Gardiner F. (ed.)

- 1973 Highway U-95 Archaeology: Comb Wash to Grand Flat. Special Report, Department of Anthropology, University of Utah (limited distribution), Salt Lake City.

Daugherty, Richard D.

- 1956 Archaeology of the Lind Coulee site, Washington. Proceedings of the American Philosophical Society, 100(30):223-278.
- 1962 The Intermontane Western Tradition. American Antiquity, 28(2):144-150.

Davis, E. Mott

- 1953 Recent data from two Paleo-Indian sites on Medicine Creek, Nebraska. American Antiquity, 18(4):380-386.
- 1956 Archeological Survey of the Big Sandy Reservoir Area, Southwestern Wyoming. Notebook No. 2, Laboratory of Anthropology. Lincoln: The University of Nebraska Press.
- 1962 Archeology of the Lime Creek Site in southwestern Nebraska. Special Publication of the University of Nebraska State Museum, No. 3.

Davis, Leslie B.

- 1971 The Lindsey Mammoth site (24DW501): Paleontology and paleoecology. Paper presented at the Annual Meeting of the Montana Archaeological Society, 1971.
- 1972 The Prehistoric Use of Obsidian in the Northwestern Plains. Ph.D. dissertation, University of Calgary, Alberta, Canada.
- 1973 Schmitt (24BW559): A Middle Period mine at the Missouri River headwaters, Montana. Paper presented at the Thirty-first Plains Conference at Columbia, Missouri, 1973.
- 1976 Missouri River Breaks area. Archaeological and historical values. Bureau of Land Management Report, Billings, Montana.
- 1978 Twentieth century commercial mining of Northern Plains bison kills. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No 14.

Davis, Leslie B. (ed.)

- 1978 Panel discussion: Symposium on bison procurement and utilization. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Davis, Leslie B., and Emmett Stallcop

- 1965 The Keastor site (24PH401): A stratified bison kill occupation in the Missouri Breaks area of north-central Montana. Montana Archaeological Society Memoir, No. 2.
- 1966 The Wahnka Chu'gn site (24HL101): Late hunters in the Milk River Valley, Montana. Montana Archaeological Society Memoir, No. 3.

Davis, Leslie B., and Michael Wilson (eds.)

- 1978 Bison Procurement and Utilization: A Symposium. Plains Anthropologist Memoir, No. 14.

Davis, Leslie B., and Charles D. Zier

- 1978 Multi-phase Late Period bison procurement at the Antonsen site, southwestern Montana. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Day, Kent C.

- 1963 Addendum II: Lithic sites in Sanpete County, Utah. In Archaeological Survey of the Flaming Gorge Reservoir Area, Wyoming-Utah. Kent C. Day and David S. Dibble, eds. University of Utah Anthropological Papers, No. 65, Upper Colorado Series, 9:1-4.
- 1964 Thorne Cave, northeastern Utah: Archaeology. American Antiquity, 30(1):50-59.
- 1966 Excavations at Gunlock Flats, southwestern Utah. Miscellaneous Papers, No. 11, University of Utah Anthropological Papers, 83:1-48.

Day, Kent C., and David S. Dibble

- 1963 Archaeological survey of the Flaming Gorge Reservoir Area, Wyoming-Utah. University of Utah Anthropological Papers, No. 65, Upper Colorado Series, No. 9.

Denig, Edwin T.

- 1930 Indian tribes of the Upper Missouri. Forty-sixth Annual Report of the Bureau of American Ethnology, pp. 375-628.

Dibble, David S.

- 1961 Preliminary Archaeological Survey of the Flaming Gorge Reservoir, Utah-Wyoming. Unpublished manuscript, Department of Anthropology, University of Utah. Salt Lake City.

Dibble, David S., and Kent C. Day

- 1962 A preliminary survey of the Fontenelle Reservoir, Wyoming. University of Utah Anthropological Papers, No. 38, Upper Colorado Series, No. 7.

Dibble, David S., and Dessemee Lorrain

- 1968 Bonfire Shelter: A stratified bison kill site, Val Verde County, Texas. Texas Memorial Museum, Miscellaneous Papers, No. 1.

Dick, Herbert W., and B. Mountain

- 1960 The Claypool site: A Cody Complex site in northeastern Colorado. American Antiquity, 26(2):223-235.

Dorsey, George A.

- 1900 An aboriginal quarzite quarry in eastern Wyoming. Publications of the Field Columbian Museum, Anthropological Series II, 4:231-232.

Dort, Wakefield, Jr.

- 1968 Paleoclimatic implications of soil structures at the Warden Site (Owl Cave). Tebiwa, 11(1):31-36.

- 1975 Archaeo-geology of Jaguar Cave, Upper Birch Valley, Idaho. Tebiwa, 17(2):33-57.

Dort, Wakefield, Jr., and Knox Jones, Jr. (eds.)

- 1970 Pleistocene and Recent Environments of the Central Great Plains. University of Kansas Special Publication, No. 3.

Dueholm, Keith

- 1981 Vegetation Communities and Plant Resources in the Salt Wells Study Area. Appendix I, Results of the Class II Resource Inventory for the Salt Wells Resource Area, Sweetwater County, Wyoming. Rock Springs: Archaeological Services, Western Wyoming College.

Duguid, J. O.

- 1968 The Irvine site: A possible Avonlea site in eastern Wyoming. Wyoming Archaeologist, 11(2):24-34.

Dunham, Dick, and Vivian Dunham

- 1947 Our Strip of Land, A History of Daggett County, Utah. Manila, UT: Daggett County Lions Club. (Second printing by the Lusk Herald, Lusk, Wyoming).

Durrant, Stephen D., and Nowlan K. Dean

- 1960 Mammals of Flaming Gorge Reservoir Area. In Ecological Studies of the Flora and Fauna of the Flaming Gorge Reservoir Basin, Utah and Wyoming. Seville Flowers et al. University of Utah Anthropological Papers, No. 48, Upper Colorado Series, 3:209-233.

- Eddy, J. A.
1974 Astronomical alignment of the Bighorn Medicine Wheel. Science, 184:1035-1043.
- Elasser, Albert B.
1958 The surface archaeology of site 26-Pe-5, Pershing County, Nevada. Report of the University of California Archaeological Survey, 44(2):26-51.
- Enger, Walter D.
1942 Archeology of Black Rock 3 Cave, Utah. University of Utah Anthropological Papers, No. 7 (reprinted 1950). Salt Lake city.
- Enger, Walter D., and William C. Blair
1947 Crania from the Warren Mounds and their possible significance to Northern Periphery archaeology. American Antiquity, 13(2):142-146.
- Euler, Robert C.
1963 Archeological problems in western and northwestern Arizona 1962. Plateau, 35(3):78-85.
1964 Southern Paiute archaeology. American Antiquity, 29(3):379-381.
- Ewers, John C.
1955 The horse in Blackfoot Indian culture. Bureau of American Ethnology Bulletin, No. 159.
- Farmer, T. R., A. H. Zier, and K. D. Black
1981 Prehistoric Resources. Class I Cultural Resources Overview for the La Sal Shale Oil Pipeline. Report prepared for Woodward-Clyde by Metcalf-Zier Archaeologists, Inc.
- Fawcett, William B., Jr.
1978 Chronology and culture process: A methodological consideration. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:133-138.
1979a An examination of projectile point variability in open and rockshelter sites in Wyoming. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.
1979b Separation: Historical archaeology at a Union Pacific railroad station in the Red Desert of Wyoming. Paper presented at the Thirty-seventh Annual Plains Conference, Kansas City, Missouri, October 31-November 3, 1979.

Figgins, Jesse D.

1927 The antiquity of man in America. Natural History, 27(3):229-239.

1933 A further contribution to the antiquity of man in America. Proceedings of the Colorado Museum of Natural History, 12(2):4-8.

Fisher, Peter F., and Nicholas E. Hakiel

n.d. The influence of geomorphology on archaeological site location in the Upper Green River Basin, Wyoming. Manuscript on file, Remote Sensing Section, Branch of Cultural Research, National Park Service. Santa Fe.

Fite, Gilbert C.

1966 The Farmers' Frontier, 1865-1900. New York: Holt, Rinehart, and Winston.

Flayharty, R., and Elizabeth Anne Morris

1974 T-W Diamond: A stone ring in northern Colorado. Plains Anthropologist, 19(65):161-172.

Flowers, Seville

1960 Vegetation of Flaming Gorge Reservoir Basin. In Ecological Studies of the Flora and Fauna of the Flaming Gorge Reservoir Basin, Utah and Wyoming. Seville Flowers et al. University of Utah Anthropological Papers, No. 48, Upper Colorado Series, No. 3.

Forbis, Richard G.

1962 The Old Women's Buffalo Jump, Alberta. National Museum of Canada, Bulletin, No. 180, Contributions to Anthropology, 1957:119-164.

1968 Fletcher: A Paleo-Indian site in Alberta. American Antiquity, 33(1):1-10.

1978 Some facets of communal hunting. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Forbis, Richard G., and J. D. Sperry

1952 An early man site in Montana. American Antiquity, 18:127-133.

Forbis, Richard G., and William Duncan Strong

n.d. Signal Butte and MacHaffie: Two stratified sites on the northern Great Plains. Unpublished manuscript.

Fowler, Don

1968a Archaeological survey in eastern Nevada, 1966. Desert Research Institute, Technical Report Series S-H, Social Sciences and Humanities Publications, No. 2.

1968b The archaeology of Newark Cave, White Pine County, Nevada. Desert Research Institute, Technical Report Series S-H, Social Sciences and Humanities Publications, No. 3.

Francis, J.

1980 Procurement and utilization of chipped stone raw materials: A case study from the Bighorn Mountains and basin of north-central Wyoming. Proposal for a Ph.D. dissertation, Arizona State University. Tempe.

1981 Distinguishing site function of open lithic scatters: An example from the Coal Creek area, Powder River Basin, Wyoming. Paper presented at the Thirty-eighth Annual Plains Conference, Iowa City, Iowa.

Frazer, Robert W.

1965 Fortes of the West: Military Forts and Precidios and Forts Commonly Called Forts West of the Mississippi to 1898. Norman: University of Oklahoma Press.

Frison, George C.

1962 Wedding of the Waters Cave: A stratified site in the Bighorn Basin of northern Wyoming. Plains Anthropologist, 7(18):246-265.

1965 Spring Creek Cave, Wyoming. American Antiquity, 31(1):81-94.

1967a Archaeological Evidence of the Crow Indians in Northern Wyoming: A Study of a Late Prehistoric Buffalo Economy. Ph.D. dissertation, University of Michigan.

1967b The Piney Creek sites, Wyoming. University of Wyoming Publications, 33(1):1-92.

1968a Daugherty Cave, Wyoming. Plains Anthropologist, 13(42):253-295.

1968b A functional analysis of certain chipped stone tools. American Antiquity, 33(2):149-155.

1968c Site 48SH312: An early Middle Period bison kill in the Powder River Basin, of Wyoming. Plains Anthropologist, 13(39):31-39.

1970a The Glenrock Buffalo Jump, 48CO304: Late Prehistoric Period Buffalo Procurement and Butchering. Plains Anthropologist Memoir, No. 7.

1970b The Kobold site, 24BH406: A post-Altithermal record of buffalo-jumping for the Northwestern Plains. Plains Anthropologist, 15(47):1-35.

1971a The buffalo pound in Northwestern Plains prehistory: Site 48CA302, Wyoming. American Antiquity, 36(1):77-91.

1971b Shoshonean antelope procurement in the Upper Green River Basin, Wyoming. Plains Anthropologist, 16(54):258-284.

1972 Buffalo procurement. In Social Exchange and Interaction. Edwin Wilmsen, ed. Anthropological Papers, No. 46. Ann Arbor: University of Michigan.

- 1973a Early Period marginal cultural groups in northern Wyoming. Plains Anthropologist, 18(62):300-312.
- 1973b The Wardell Buffalo Trap 48BU301: Communal Procurement in the Upper Green River Basin, Wyoming. Anthropological Papers of the Museum of Anthropology, University of Michigan, 48:1-111.
- 1974a The application of volcanic and non-volcanic natural glass studies to archaeology in Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- 1974b The Casper Site: A Hell Gap Bison Kill on the High Plains. New York: Academic Press.
- 1976a The chronology of Paleo-Indian and Altithermal cultures in the Bighorn Basin, Wyoming. Cultural Change and Continuity: Essays in Honor of James Bennett Griffin. Charles E. Cleland, ed. New York: Academic Press.
- 1976b Crow pottery in northern Wyoming. Plains Anthropologist, 21(71):29-44.
- 1976c Cultural activity associated with prehistoric mammoth butchering and processing. Science, 194:728-730.
- 1978a Animal population studies and cultural inference. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1978b Prehistoric Hunters of the High Plains. New York: Academic Press.
- 1980 Folsom Tools and Technology at the Hanson Site, Wyoming. Albuquerque: University of New Mexico Press.

Frison, George C., and Donald C. Grey

- 1980 Pryor Stemmed: A specialized Paleo-Indian ecological adaptation. Plains Anthropologist, 25(87):83-85.

Frison, George C., and Marion Huseas

- 1968 Leigh Cave, Wyoming, 48WA304. Wyoming Archaeologist, 11(3):20-33.

Frison, George C., and Charles A. Reher

- 1970 Age determination of buffalo by teeth eruption and wear. The Glenrock Buffalo Jump, 48CO304. Plains Anthropologist Memoir, No. 7, Appendix I.

Frison, George C., and Michael Wilson

- 1975 An introduction to Bighorn Basin archaeology. Wyoming Geological Association Twenty-seventh Annual Field Conference Guidebook, pp. 19-35.

Frison, George C., Michael Wilson, and Danny N. Walker

- n.d. The Big Goose Creek site, Wyoming: Bison procurement and faunal analysis. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.

Frison, George C., Michael Wilson, and Diane J. Wilson

- 1974 The Holocene stratigraphic archaeology of Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- 1976 Fossil bison and artifacts from an early Altithermal Period arroyo trap in Wyoming. American Antiquity, 41(1):28-57.

Fritts, Harold C.

- 1965 Tree-ring evidence for climatic changes in western North America. Monthly Weather Review, 93(7):421-443.

Fry, Gary

- 1968 Prehistoric Diet at Danger Cave, Utah, as Determined by the Analysis of Coprolites. Miscellaneous Paper, No. 23, University of Utah Anthropological Papers, No. 99. Salt Lake City.
- 1970 Analysis of Prehistoric Coprolites from Utah. University of Utah Anthropological Papers, No. 97. Salt Lake City.
- 1971 Preliminary report on Foss-Thomas site. Wyoming Archaeologist, 14(1):15-22.

Fry, Gary, and Gardiner F. Dalley

- 1973 The Levee Site and Knoll Site. University of Utah Anthropological Papers, No. 100. Salt Lake City.

Gaarder, Lorin R.

- 1967 Excavations at a campsite on Eagle Creek (north-central Idaho). Tebiwa, 10(2):39-62.
- 1968 A report on archaeological testing of Site 10-CW-5, Clearwater River, north-central Idaho. Tebiwa, 7(2):28-36.

Galinat, Walton C., and James H. Gunnerson

- 1963 Spread of Eight-rowed Maize from the Prehistoric Southwest. Botanical Museum Leaflets, Harvard University, 20(5):117-160. Cambridge, MA.

Galloway, Eugene

- 1962 The Leath burial - A preliminary report. Wyoming Archaeologist, 5(2):2-7.

Galloway, Eugene, and George A. Agogino

- 1961 The Johnson site: A Folsom campsite. Plains Anthropologist, 6(13):205-208.

Galvan, M. E.

- 1976 The vegetative ecology of the Medicine Lodge Creek site: An approach to Archaic subsistence problems. Master's thesis, University of Wyoming. Laramie.

Gant, Robert, and Wesley Hurt

- 1965 The Sturgis Archaeological Project: An archaeological survey of the Black Hills. South Dakota Museum News, 26(7-8):1-51.

Garbarino, Merwyn S.

- 1976 Native American Heritage. Boston: Little, Brown.

Gear, M., and B. Walker

- 1980 Preliminary Report on the Archaeological Survey of the Proposed Mountain Fuel Resources Overthrust Pipeline. Report prepared for Mountain Fuel Resources Company by Western Wyoming College. Rock Springs.

Gebhard, David S.

- 1969 The Rock Art of Dinwoody. Santa Barbara: The Art Galleries, University of California.

Gebhard, David S., George A. Agogino, and C. Vance Haynes

- 1964 Horned Owl Cave, Wyoming. American Antiquity, 29(3):360-368.

Gebhard, David S., and Harold A. Cahn

- 1950 The petroglyphs of Dinwoody, Wyoming. American Antiquity, 14(3):219-228.

- 1954 Petroglyphs in the Boysen Reservoir area. In Archeological Investigations of the Shoshone Basin of Wyoming. William T. Mulloy, ed. Wyoming Publications in Science, 18(1):66-70.

Gilbert, B. Miles

- 1975 Preliminary report to the Bureau of Land Management and National Park Service on the 1975 field season at Natural Trap Cave, Wyoming. Unpublished manuscript.

Gilbert, G. K.

- 1980 Lake Bonneville. United States Geological Survey Monograph, No. 1.

Gill, George W.

- 1974 Human skeletons from Wyoming and their bearing on the concept of morphological dating. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Gill, J. R., E. A. Merewether, and W.A. Cobban

- 1970 Stratigraphy and nomenclature of some Upper Cretaceous and Lower Tertiary rocks in south-central Wyoming. Geological Survey Professional Paper, 667.

Gillin, John

- 1938 Archeological investigations in Nine Mile Canyon, Utah. University of Utah Anthropological Papers, No. 21. (reprinted 1955). Salt Lake City.
- 1941 Archeological investigations in central Utah. Papers of the Peabody Museum of Archaeology and Ethnology, 17(2). -Cambridge, MA.
- 1955 Archeological investigations in Nine Mile Canyon, Utah: A republication. University of Utah Anthropological Papers, No. 21. Salt Lake City.

Goetzmann, William H.

- 1960 Exploration and Empire: The explorer and the scientist in winning the American West, 1803-1863. New Haven: Yale University Press.

Gowans, Fred. R., and Eugene E. Campbell

- 1975 Fort Bridger, Island in the Wilderness. Provo, UT: Brigham Young University Press.

Grady, James

- 1980 Environmental factors in archaeological site locations. Colorado Bureau of Land Management Cultural Resource Series, No. 9. Denver.

Green, Dee F.

- 1964 The Hinckley figurines as indicators of the position of Utah Valley in the Sevier culture. American Antiquity, 30(1):74-80.

Greene, Anne Monseth

- 1967 The Betty Greene site: A late Paleo-Indian site in eastern Wyoming. Master's thesis, University of Pennsylvania.
- 1968 Age and archaeological association of oblique flaked projectile points at the Betty Greene site, eastern Wyoming. Abstract of Papers, Thirty-third Annual Meeting of the Society for American Archaeology at Santa Fe.

Grey, Donald C.

- 1963a Bighorn Medicine Wheel, 48BH302. Plains Anthropologist, 8(19):27-41.

- 1963b The Turk Burial site, 48WA301, Washakie County, Wyoming. Plains Anthropologist, 8(20):98-102.

Grinnell, George Bird

- 1923 The Cheyenne Indians: Their History and Ways of Life. New Haven: Yale University Press.

Gruhn, Ruth

- 1961a The archaeology of Wilson Butte Cave, south-central Idaho. Occasional Papers of the Idaho State College Museum, No. 6. Pocatello.
- 1961b A collection of artifacts from Pence-Duerig Cave in south-central Idaho. Tebiwa, 4(1):1-24.
- 1964 Test excavations at Sites 10-OE-128 and 10-OE-129, southwest Idaho. Tebiwa, 7(2):28-36.
- 1965 Two early radiocarbon dates from the lower levels of Wilson Butte Cave, south-central Idaho. Tebiwa, 8(2):57.

Guilday, John E., H. W. Hamilton, and E. K. Adam

- 1967 Animals remains from Horned Owl Cave, Albany County, Wyoming. University of Wyoming, Contributions to Geology, 6:97-99.

Gumerman, George J. (ed.)

- 1971 The Distribution of Prehistoric Population Aggregates. Prescott College Anthropological Reports, 1:1-164. Prescott, AZ.

Gunnerson, James H.

- 1956a Fremont ceramics. In Papers of the Third Great Basin Conference. Fay-Cooper Cole et al. University of Utah Anthropological Papers, 26:54-62. Salt Lake City.
- 1956b Plains-Promontory relationships. American Antiquity, 22(1):69-72.
- 1956c A fluted point site in Utah. American Antiquity, 21(4):412-414.
- 1957 An archeological survey of the Fremont area. University of Utah Anthropological Papers, No. 28. Salt Lake City.
- 1958 Archeological survey of the Woodruff Narrows Reservoir, Uinta County, Wyoming. Unpublished manuscript, Department of Anthropology, University of Utah. Salt Lake City.
- 1960a The Fremont Culture: Internal dimensions and external relationships. American Antiquity, 25(3):373-380.
- 1960b An Introduction to Plains Apache Archeology: The Dismal River Aspect. Bureau of American Ethnology, Bulletin 173, Anthropological Papers, No. 58.

- 1962 Plateau Shoshonean prehistory: A suggested reconstruction. American Antiquity, 28(1):41-50.
- Hack, John T.
1943 Antiquities of the Finley site. American Antiquity, 8(3):235-241.
- Hadley, A. F., and B. A. Schumm
1961 Sediment sources and drainage basin characteristics in the Upper Cheyenne River Basin. USGS Water Supply Paper, No. 1531-B.
- Hafen, LeRoy R.
1926 The Overland Mail. Cleveland: Arthur H. Clark Co.
1965 The Mountain Men and the Fur Trade of the Far West. Glendale: Arthur H. Clark Co.
- Hafen, LeRoy R., and Francis Maria Young
1938 Fort Laramie and the Pageant of the West 1834-1890. Glendale: Arthur H. Clark Co.
- Haines, Aubrey L.
1973 Historic Resources Study of Historic Sites Along the Oregon Trail. Denver: Denver Service Center, National Park Service.
- Haines, Frances
1938 The northward spread of horses among the Plains Indians. American Anthropologist, n.s., 40(3):429-437.
- Hakiel, Nicholas E., and Bridget M. Hakiel
1981 Field Evaluation and Historic Profile of the South Pass-Point of Rocks Stage and Wagon Route in Sweetwater County, Wyoming. Conducted for Davis Oil, Reliance, Wyoming.
- Hamilton, John W., and Carl S. Gilbert
1972 Composition of Wyoming Range Plants and Soils. University of Wyoming Agricultural Experiment Station Research Journal, 55.
- Hansen, Henry P.
1951 Pollen analysis of peat sections from near the Finley Site, Wyoming. In Early Man in the Eden Valley. John Moss et al. University of Pennsylvania, The University Museum, Museum Monographs.
- Hansen, Wallace R.
1955 Geological Map of the Flaming Gorge Quadrangle, Utah-Wyoming. Washington: U. S. Geological Survey.

Hansen, Wallace R., and Manuel G. Bonilla

- 1956 Geology of the Manila Quadrangle, Utah-Wyoming. Washington: U.S. Geological Survey.

Harrington, Mark R.

- 1927 A primitive Pueblo city in Nevada. American Anthropologist, 29(3):262-277.
- 1957 A Pinto site at Little Lake, California. Southwest Museum Papers, No. 17. Los Angeles.

Harrington, Mark R., and Ruth D. Simpson

- 1961 Tule Springs, Nevada, with other evidences of Pleistocene man in North America. Southwest Museum Papers, No. 18. Los Angeles.

Hart, Jeff

- 1976 Montana-Native Plants and Early Peoples. Helena: Montana Historical Society and the Montana Botanical Administration.

Haynes, C. Vance, Jr.

- 1964 Fluted projectile points: Their age and dispersion. Science, 145(3639):1408-1413.
- 1967 Carbon-14 dates and early man in the New World. Pleistocene Extinctions: The Search for a Cause. P. B. Martin and H. E. Wright, eds. New Haven: Yale University Press.
- 1968 Geochronology of late Quaternary alluvium. Means of Correlation of Quaternary Successions. R. B. Morrison and H. E. Wright, eds. Pp. 591-631. Salt Lake City: University of Utah Press.
- 1969 The earliest Americans. Science, 166:709-715.
- 1970 Geochronology of man-mammoth sites and their bearing on the origin of the Llano Complex. In Pleistocene and Recent Environments of the Central Great Plains. Wakefield Dort, Jr., and Knox Jones, Jr., eds. University of Kansas Special Publication, No. 3.

Heisley, E. L.

- 1951 Geology of the Ferris Mountains-Muddy Gap Area. Wyoming Geological Association Sixth Annual Field Conference Guidebook. Casper.

Heizer, Robert F., and M. A. Baumhoff

- 1961 The archaeology of two sites at Eastgate, Churchill County, Nevada: I. Wagon Jack Shelter. University of California Anthropological Records, 20(4):119-138.

Heizer, Robert F., and Lewis E. Napton

- 1970 Archaeological investigations in Lovelock Cave, Nevada. In Archaeology and the Prehistoric Great Basin Lacustrine Subsistence Regime as Seen from Lovelock Cave, Nevada. Robert F. Heizer et al. Contributions of the University of California Archaeological Research Facility, 10:1-86. Berkeley.

Heizer, Robert F., and Thomas R. Hester

- 1978a Great Basin. Chronologies in New World Archaeology. R. E. Taylor and C. W. Meighan, eds. New York: Academic Press.

- 1978b Great Basin projectile points: Forms and chronology. Ballena Publications in Archaeology and History, No. 10.

Heizer, Robert F., and Richard A. Brooks

- 1965 Lewisville--Ancient campsite or wood rat houses? Southwestern Journal of Anthropology, 21(2):155-165.

Hemmings, E. T.

- 1969 Analysis of a Clovis bison kill site and processing area. Paper presented at the Thirty-fourth Annual Meeting of the Society for American Archaeology at Milwaukee, 1962.

Hester, Thomas R., and Robert F. Heizer

- 1973 Review and Discussion of Great Basin Projectile Points: Forms and Chronology. Berkeley: Archaeological Research Facility, Department of Anthropology, University of California.

Hewes, Gordon

- 1948 Early tribal migrations on the northern Great Plains. Plains Archaeological Conference Newsletter, 4:49-61.

Hickman, Barbara J.

- 1981 Observed and collected prehistoric material culture. In Task III: Final Report on the Class II Cultural Resource Inventory for the Overthrust Belt Area in Southwestern Wyoming. Ronald E. Kainer, ed. Pp. 110-157. Rock Springs: Archaeological Services, Western Wyoming College.

Hill, A. T., and George Metcalf

- 1942 A site of the Dismal River Aspect in Chase County, Nebraska. Nebraska Historical Magazine, 22(2):158-226.

Hilman, Ross G.

- 1978 Potential food plants of the Red Desert, Table 3. In An Archaeological Overview of the Red Desert. Manuscript submitted to Ronald E. Kainer for Western Wyoming College 1978, End of Year Report. Rock Springs.

Hoffman, J. Jacob

- 1953 Comments on the use and distribution of tipi rings in Montana, North Dakota, South Dakota, and Wyoming. Montana State University, Anthropology and Sociology Papers, No. 14.

Holder, Preston

- 1970 The Hoe and the Horse on the Plains. Lincoln: University of Nebraska Press.

Holmer, Richard H.

- 1977 Projectile points. In Sudden Shelter. Jesse D. Jennings, et al. University of Utah Anthropological Papers, No. 98.
- 1979 Split Mountain Cultural Study Tract. Archaeological Center, Department of Anthropology, University of Utah.

Holmes, G. William

- 1951 The regional significance of the Pleistocene deposits in the Eden Valley, Wyoming. In Early Man in the Eden Valley. John H. Moss et al. University of Pennsylvania, The University Museum, Museum Monographs.

Hopkins, M. L., and B. Robert Butler

- 1961 Remarks on a notched bison Ischium. Tebiwa, 4(2):10-18.

Hornaday, William T.

- 1887 The extermination of the American bison. Annual Report of the U. S. National Museum.

Howard, Edgar B.

- 1943 The Finley Site: Discovery of Yuma points, in situ, near Eden, Wyoming American Antiquity, 8(3):224-234.

Howard, Edgar B., Linton Satterthwaite, Jr., and Charles Bache

- 1941 Preliminary report on a buried Yuma site in Wyoming. American Antiquity, 7(1):70-74.

Howells, W. W.

- 1938 Crania from Wyoming resembling "Minnesota Man". American Antiquity, 3(4):318-326.

Huckell, Bruce B.

- 1979 Of chipped stone tools, elephants, and Clovis hunters: An experiment. Plains Anthropologist, 24(85):177-189.

Hughes, Jack T.

- 1948 Supplementary Appraisal of the Archaeological and Paleontological Resources of the Tiber Reservoir, Toole and Liberty Counties, Montana. (mimeographed report). Lincoln: River Basin Survey, Smithsonian Institution.
- 1949 Investigations in western South Dakota and northeastern Wyoming. American Antiquity, 14(4):266-277.
- 1950 Archaeology and Environment in the western Great Plains. In Proceedings of the Sixth Annual Plains Conference, 1948. Jesse D. Jennings, ed. University of Utah Anthropological Papers, No. 11. Salt Lake City.

Hughes, Susan S.

- 1978 Bison diminution on the Great Plains. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:18-47.

Hunt, Alice P.

- 1953 Archeological survey of the La Sal Mountain area, Utah. University of Utah Anthropological Papers, No. 14. Salt Lake City.

Hunt, Alice P., and Dallas Tanner

- 1960 Early man sites near Moab, Utah. American Antiquity, 26(1):110-117.

Hurlbutt, Robert E.

- 1977 Environmental constraint and settlement predictability, northwestern Colorado. Colorado Bureau of Land Management Cultural Resource Series, No. 3.

Hurst, C. T.

- 1943 A Folsom site in a mountain valley of Colorado. American Antiquity, 8(3):250-253.

Hurt, Wesley R.

- 1961 Review of A Preliminary Historical Outline for the Northwestern Plains, by William Mulloy. Plains Anthropologist, 6(13):213-215.

Huscher, Betty H., and Harold A. Huscher

- 1942 Athapaskan migration via the Intermontane region. American Antiquity, 8(1):80-88.

Husted, Wilfred M.

- 1963 A rock alignment in the Colorado Front Range. Plains Anthropologist, 8(22):221-223.
- 1969 Bighorn Canyon Archeology. Smithsonian Institution, River Basin Surveys,

n.d. The archeology of Mummy Cave: An introduction to Shoshonean prehistory. Unpublished manuscript.

IMACS

1983 Intermountain Antiquities Computer System User's Guide. Salt Lake City: Archaeological Center, Department of Anthropology, University of Utah.

Irwin, Cynthia, and Henry T. Irwin

1957 Archaeology of the Agate Bluff area, Colorado. Plains Anthropologist, 8:15-38.

Irwin, Cynthia, Henry T. Irwin, and George A. Agogino

1962 Wyoming muck tells of battle: Ice Age man vs. mammoth. National Geographic, 121(6):828-837.

Irwin, Henry T.

1970 Archeological investigations at the Union Pacific mammoth kill site, Wyoming, 1961. National Geographic Society Research Reports, 1961-1962. Pp. 123-125.

Irwin, Henry T., and Cynthia Irwin

1959 Excavations at the LoDaiska site. Denver Museum of Natural History, Proceedings, No. 8.

Irwin, Henry T., and H. M. Wormington

1970 Paleo-Indian tool types in the Great Plains. American Antiquity, 35(1):24-34.

Irwin-Williams, Cynthia

1967 Picosa: The elementary Southwestern culture. American Antiquity, 32(4):441-457.

Irwin-Williams, Cynthia, and Henry T. Irwin

1966 Excavations at Magic Mountain. Denver Museum of Natural History, Proceedings, No. 12.

Irwin-Williams, Cynthia, Henry T. Irwin, George A. Agogino, and C. Vance Haynes, Jr.

1973 Hell Gap: Paleo-Indian occupation on the High Plains. Plains Anthropologist, 18(59):40-53.

Jacobsen, R. Brooke, and Jeffrey L. Eighm

1980 A mathematical theory of horse adoption on the North American Plains. Plains Anthropologist, 25(90):333-341.

James, L. F., R. F. Keeler, Z. E. Johnson, M. C. Williams, E. H. Cronin, and J. D. Olsen

- 1980 Plants poisonous to livestock in the western states. USDA Agriculture Information Bulletin, No. 415.

Jameson, Sidney S.

- 1958 Archeological notes on Stansbury Island. University of Utah Anthropological Papers, No. 34. Salt Lake City.

Jennings, Jesse D.

- 1953 Danger Cave: A progress report. El Palacio, 60(5):179-213.
- 1955 The Archeology of the Plains: An Assessment. National Park Service and University of Utah. Salt Lake City. (limited distribution, multilithed).
- 1957 Danger Cave. University of Utah Anthropological Papers, No. 27. Salt Lake City. (also released as Memoirs of the Society for American Archaeology, No. 14).
- 1964 The Desert West. Prehistoric Man in the New World. Jesse D. Jennings and Edward Norbeck, eds. Pp. 149-174. Chicago: The University of Chicago Press.
- 1968 Prehistory of North America. New York: McGraw Hill.
- 1974 Prehistory of North America. Second edition. New York: McGraw Hill.
- 1978 Prehistory of Utah and the eastern Great Basin. University of Utah Anthropological Papers, No. 98. Salt Lake City.

Jennings, Jesse D., et al.

- 1956 The American Southwest: A problem in cultural isolation. In Seminars in Archeology: 1955. Robert Wauchop, ed. Memoirs of the Society for American Archaeology, 11:59-128.
- 1977 Sudden Shelter. University of Utah Anthropological Papers, No. 98. Salt Lake City.

Jepson, Glenn L.

- 1953 Ancient buffalo hunters of northwestern Wyoming. Southwestern Lore, 19:19-25.

Johnson, Ann M.

- 1977 The Dune Buggy Site 24RV1, and northwestern Plains ceramics. Plains Anthropologist, 22(75):37-49.

Johnson, Eileen

- 1978 Paleo-Indian bison procurement and butchering patterns on the Llano Estacado. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1980 Updating comments on "Paleo-Indian bison procurement and butchering patterns on the Llano Estacado." Plains Anthropologist, 25(87):83-85.

Johnson, Eileen and Vance T. Halliday

- 1980 A Plainview kill/butchering locale on the Llano Estacado: The Lubbock Lake site. Plains Anthropologist, 25(88, Pt. 1):89-111.

Johnson, Eileen, Vance T. Halliday, and Raymond W. Neck

- 1982 Lake Theo: Late Quaternary paleoenvironmental data and new Plainview (Paleo-Indian) dates. North American Archaeologist, 3(2).

Johnson, Kendall L.

- 1980a Big Sagebrush. University of Wyoming Agricultural Extension Service, B-638.1. Wyoming Range Plant Series.
- 1980b Indian Paintbrush. University of Wyoming Agricultural Extension Service, B-638.2. Wyoming Range Plants Series.
- 1980c Western Wheatgrass. University of Wyoming Agricultural Extension Service, B-638.3. Wyoming Range Plants Series.
- n.d.a Skunkbrush Sumac Rhus trilobata. University of Wyoming Agricultural Extension Service, B-638.4. Wyoming Range Plant Series.
- n.d.b Geranium Geranium Spp. University of Wyoming Agricultural Extension Service, B-638.5. Wyoming Range Plants Series.
- n.d.c Indian Ricegrass Oryzopsis hymenoides. University of Wyoming Agricultural Extension Service, B-638.6. Wyoming Range Plant Series.

Johnston, A.

- 1970 Blackfoot Indian utilization of the flora of the northwestern Great Plains. Economic Botany, 24:301-324.

Jones, William A.

- 1874 Report on the Reconnaissance of Northwestern Wyoming. Washington, DC: U. S. Government Printing Office.

Judge, W. James

- 1971 An interpretive framework for understanding site locations. In The Distribution of Prehistoric Population Aggregates. George J. Gumerman, ed. Prescott College Anthropological Reports, No. 1. Prescott, AZ.

Kainer, Ronald E.

1980 Task I: Base Data and Research Design for the Class II Cultural Resource Inventory of the overthrust Belt Area in Southwestern Wyoming. Report submitted to the Bureau of Land Management by Western Wyoming College, (Contract Number YA-512-CT9-201).

1981 Final Report on the Results of the Class II Cultural Resource Inventory of the Overthrust Belt Area in Southwestern Wyoming. Rock Springs: Archaeological Services, Western Wyoming College.

Karlstrom, E. T.

1977 Genesis, morphology, and stratigraphy of soils at the Laddie Creek archaeological site, Bighorn Mountains, Wyoming. Master's thesis, Department of Geography, University of Wyoming. Laramie.

Kehoe, Alice B.

1959 Ceramic affiliation in the Northwestern Plains. American Antiquity, 25(2):237-246.

Kehoe, Thomas F.

1955 Some chipped stone artifacts from southwestern Idaho. Plains Anthropologist, 3:13-18.

1960 Stone tipi rings in north-central Montana and the adjacent portion of Alberta, Canada: Their historical, ethnological, and archeological aspects. Bureau of American Ethnology, Bulletin 173, Anthropological Papers, 62:417-474.

1967 The Boarding School Bison Drive site. Plains Anthropologist Memoir, No. 4.

1973 The Gull Lake site: A prehistoric bison drive site in southwestern Saskatchewan. Milwaukee Public Museum, Publications in Anthropology and History, No. 1.

1978 Paleo-Indian bison drives: Feasibility studies. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Kehoe, Thomas F., and Bruce A. McCorquodale

1961 The Avonlea point-Horizon marker for the Northwestern Plains. Plains Anthropologist, 6(13):179-188.

Kelly, Isabel T.

1934 Southern Paiute Bands. American Anthropologist, 36(4):548-560.

Kelly, J. Charles

- 1947 The cultural affiliations and chronological position of the Clear Fork Focus. American Antiquity, 13(2):97-109.

Keyser, James D.

- 1974 The LaMarche game trap: An early historic game trap in southwestern Montana. Plains Anthropologist, 19(65):173-179.

Rivett, Marvin F.

- 1962 Logan Creek Complex. Paper presented at the Twentieth Plains Anthropological Conference at Lincoln, Nebraska, November, 1962.

Knight, S. H.

- 1950 Physical aspects of the Green River Basin and adjacent mountain ranges. Wyoming Geological Association Fifth Annual Field Conference Guidebook, 1950. Casper.
- 1974 Geologic history of the Wyoming landscapes. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Knudson, Ruthann

- 1970 Hypsithermal cultures on the High Plains: A suggested model. Paper presented at the Thirty-fifth Annual Meeting of the Society for American Archaeology at Mexico City, May, 1970.

Koim, Kenneth E.

- 1974 ERTS MSS imagery applied to mapping sand dunes in Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Kornfeld, Marcel

- 1978 Paleo-Indian projectile point development: A model. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:148-153.
- 1983 A model of high Plains and intermountain stock raising settlement systems. North American Archaeologist, 4(1).

Krieger, Alex D.

- 1944 The typological concept. American Antiquity, 9:271-288.
- 1950 A suggested general sequence in North American projectile points. In Proceedings of the Sixth Plains Archaeological Conference, 1948. Jesse D. Jennings, ed. University of Utah Anthropological Papers, 11:117-124. Salt Lake City.

1962 The earliest cultures in the western United States. American Antiquity, 28(2):138-143.

1964 Early man in the New World. Prehistoric Man in the New World. Jesse D. Jennings and Edward Norbeck, eds. Pp. 23-81. Chicago: University of Chicago Press.

Kuchler, A. W.

1964 Potential Natural Vegetation of the Coterminous United States. American Geographical Society Special Publication, No. 36. New York.

Kurten, Bjorn, and Elaine Anderson

1972 The sediments and fauna of Jaguar Cave: II-The fauna. Tebiwa, 15(1):21-39.

Lamb, Sidney M.

1958 Linguistic prehistory in the Great Basin. International Journal of Linguistics, 24(2):95-100.

Lane, Donald W.

1973 The Phosporia and Goose Egg Formations in Wyoming. Preliminary Report, No. 12. Laramie: The Geological Survey of Wyoming.

Larson, T. A.

1965 History of Wyoming. Lincoln: University of Nebraska Press.

1977 Wyoming: A Bicentennial History. New York: W. W. Norton.

Larson, Thomas K.

1978 Continued archaeological investigations of the Jim Bridger Mine, Sweetwater County, Wyoming: 1977 field season. Laramie: Office of the Wyoming State Archeologist.

1979a Preliminary Research Design: Overland Planning Unit Survey. Report submitted to the Bureau of Land Management by the Office of the Wyoming State Archeologist.

1979b Technical Proposal for a Level II Cultural Resources Inventory of the Overland Planning Unit, Rawlins Wyoming. Proposal on file, Office of the Wyoming State Archeologist.

n.d. Final report of the Overland Planning Unit survey. Manuscript in preparation for the Bureau of Land Management.

Larson, Thomas K., Paul H. Sanders, Carl Spath, and Keith Dueholm

1981 The 1981 Cultural Resource Inventory of the Kemmerer Coal Company Elkol-Sorenson South Block Mine. Laramie: Larson-Tibesar Associates.

Lataday, William R.

- 1978 Evidence for seasonal occupation from Little Canyon Creek Cave. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:48-51.

Lawrence, John C.

- 1962 Wasatch and Green River Formations of the Cumberland Gap area, Lincoln and Uinta Counties, Wyoming. Master's thesis, Department of Geology, University of Wyoming. Laramie.

Leach, Larry L.

- 1966 The archaeology of Boundary Village. Miscellaneous Paper, No. 13, University of Utah Anthropological Papers, 83:85-129. Salt Lake City.
- 1970 Archaeological Investigations at Deluge Shelter in Dinosaur National Monument. Ph.D. dissertation, Department of Anthropology, University of Colorado. Boulder.

Leonhardy, Frank C., and David G. Rice

- 1970 A proposed culture typology for the Lower Snake River region, southeastern Washington. Northwest Anthropological Research Notes, 4(1):1-29.

Leopold, Luna B., and John P. Miller

- 1954 A postglacial chronology for some alluvial valleys in Wyoming. USGS Water Supply Paper, No. 1261.

Lewis, Rhoda Owen

- 1978 Use of opal phytoliths in paleo-environmental reconstruction. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:127-132.

Lister, Robert H.

- 1951 Excavations at Hells Midden Dinosaur National Monument. University of Colorado Studies, Series in Anthropology, No. 3.
- 1953 The stemmed, indented base point, a possible horizon marker. American Antiquity, 18(3):264-265.

Lobdell, John E.

- 1973 The Scoggin site: An early Middle Period bison kill. Master's thesis, University of Wyoming. Laramie.
- 1974 The combined use of varied geologic features in bison procurement: An early Middle Period example from south-central Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Lorraine, Dessamae

- 1968 Analysis of the bison bones from Bonfire Shelter. In Bonfire Shelter: A Stratified Bison Kill Site, Val Verde County, Texas. David S. Dibble and Dessamae Lorraine, eds. Texas Memorial Museum, Miscellaneous Papers, 1:77-132.

Loud, L. L., and Mark R. Harrington

- 1929 Lovelock Cave. University of California Publications in American Archeology and Ethnology, Vol. 25. Berkeley.

Love, C. M.

- 1977 Geological influences on prehistoric populations of western Wyoming. Wyoming Geological Association Guidebook, Twenty-ninth Annual Field Conference, 1977. Pp. 15-20.

Lowie, Robert H.

- 1909 The Northern Shoshones. American Museum of Natural History Anthropological Papers, 2:2.
- 1924 Notes on Shoshonean ethnography. American Museum of Natural History Anthropological Papers, 20(3).
- 1935 The Crow Indians. New York: Holt, Rinehart, and Winston.

Lynch, Thomas F., and Lawrence Olsen

- 1964 The Columbet Creek Rockshelter (Owyhee County, Idaho). Tebiwa, 7(1):7-16.

Lynch, Thomas F., Kent S. Wilkinson, and Claude N. Warren

- 1965 Archaeological investigations at Bruces Eddy Reservoir. Tebiwa, 8(2):33-56.

McDonald, Linda

- 1974 Opal phytoliths as indicators of plant succession in north-central Wyoming. Master's thesis, University of Wyoming. Laramie.

McGrew, Paul O.

- 1961 The Rawlins Mammoth. Wyoming Geological Association Sixteenth Annual Field Conference Guidebook. Pp. 315-317.

McGuire, David J.

- 1977a Section in An Archaeological Sampling Survey of the Sweetwater-Kemmerer and Hanna-Atlantic Rim Coal ES Areas. Michael D. Metcalf, ed. Western Wyoming College Occasional Papers, No. 10. Rock Springs.
- 1977b Skull Point: A preliminary report of 48LN317. The Wyoming Archaeologist, 20(3):4-33.

McHugh, T.

- 1958 Social behavior of the American buffalo (Bison bison bison). Zoologica, 43, Pt. 1, (1):1-40.

Mackey, J. C., Douglas Kullen, Steven D. Creasman, Jill E. Sall, Kathy Harvey, and C. Lawrence Armitage

- 1982 Paleoenvironmental reconstruction and subsistence change at the Deaman Wash Site in southwestern Wyoming. Journal of Intermountain Archeology, 1(1):11-65.

Madsen, David B.

- 1971 O'Malley Shelter. Master's thesis, Department of Anthropology, University of Utah. Salt Lake City.
- 1973 Great Salt Lake Fremont ceramics. In The Levee Site and the Knoll Site. Gary Fry and Gardiner F. Dalley, eds. University of Utah Anthropological Papers, No. 100. Salt Lake City.
- 1975 Dating Paiute-Shoshone expansion in the Great Basin. American Antiquity, 40(1):80-86.
- 1978 Recent data bearing on the question of a hiatus in the eastern Great Basin. American Antiquity, 43(3):508-509.

Madsen, David B. (ed.)

- 1980 Fremont Perspective. Salt Lake City: Utah State Historical Society.

Madsen, David B., and Michael S. Berry

- 1975 A reassessment of northeastern Great Basin prehistory. American Antiquity, 40(4):391-405.

Madsen, David B., Donald R. Currey, and James H. Madsen

- 1976 Man, mammoth, and lake fluctuations in Utah. Antiquities Section Selected Papers, II(5). Salt Lake City: Department of Development Services, Division of State History.

Madsen, Rex E.

- 1972a Ceramics. The Evans Site. Michael S. Berry, ed. Pp. 45-96. Special Report, Department of Anthropology, University of Utah. Salt Lake City. (limited distribution).
- 1972b Topography, climate, and soil types as indicators of Fremont regional variations. Manuscript on file, Department of Anthropology, University of Utah. Salt Lake City.
- 1977 Prehistoric Ceramics of the Fremont. Museum of Northern Arizona Ceramic Series, No. 6. Flagstaff.

Malde, Harold E., and Asher P. Schick

1964 Thorne Cave, northeastern Utah: Geology. American Antiquity, 30(1):60-73.

Malouf, Carling

1961 The tipi rings of the High Plains. American Antiquity, 26(3, Pt. 1):381-389.

1962 Notes on the Logan Buffalo Jump. In Symposium on Buffalo Jumps. Carling Malouf and Stuart Connor, eds. Montana Archaeological Society Memoir, 1:12-15.

Mandelbaum, David G.

1940 The Plains Cree. Anthropological Papers of the American Museum of Natural History, 37:154-316.

Narcy, Cora E.

n.d. Freight and Stage Routes. Unpublished manuscript, WPA Writers Project, File #1436. Cheyenne: Wyoming State Archives and Historical Department.

Markhoff, Dena

1981a Historic Resources. Class I Cultural Resources Overview for the La Sal Oil Pipeline. Report prepared for Woodward-Clyde Consultants by Metcalf-Zier Archaeologists, Inc.

1981b Class I Inventory of Historic Cultural Resources of the Red Desert ENQ Project Area, Sweetwater County, Wyoming. Arvada, CO.

Marlow, Clayton B.

1979 Cultural Plant Resources of Wyoming's Eastern Red Desert. Report submitted to the Wyoming State Archaeologist's Office, Department of Anthropology, University of Wyoming. Laramie.

Marquis, Thomas B.

1928 Memoirs of a White Crow Indian (Thomas H. LeForge). New York: Century Co.

Martin, Paul S.

1967 Pleistocene overkill. Natural History, 76(10):32-38.

1973 The discovery of America. Science, 179:969-974.

Martin, Paul S., and Peter J. Mehringer, Jr.

- 1965 Pleistocene pollen analysis and biogeography of the Southwest. The Quaternary of the United States, Part 1: Geology. H. K. Wright, Jr., and David C. Frey, eds. Pp. 443-451. Princeton: Princeton University Press.

Martin, Paul S., and H. E. Wright, Jr.

- 1967 Pleistocene Extinctions: The Search for A Cause. New Haven: Yale University Press.

Marwitt, John P.

- 1968 Pharo Village. University of Utah Anthropological Papers, No. 91. Salt Lake City.
- 1970 Median Village and Fremont Culture Regional Variation. University of Utah Anthropological Papers, No. 95. Salt Lake City.

Marwitt, John P., Gary F. Fry, and J. M. Adovasio

- 1971 Sandwich Shelter. Great Basin Selected Papers, 1970, University of Oregon Anthropological Papers, No. 1.

Medicine Crow, Joseph

- 1962a The Crow Indian buffalo jump legends. In Symposium on Buffalo Jumps. Carling Malouf and Stuart Connors, eds. Montana Archaeological Society Memoir, 1:35-39.
- 1962b Panel discussion on buffalo jumps. In Symposium on Buffalo Jumps. Carling Malouf and Stuart Connors, eds. Montana Archaeological Society Memoir, 1:40-56.
- 1978 Notes on Crow Indian buffalo jump traditions. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Mehringer, Peter J., Jr.

- 1967 Pollen analysis and the alluvial chronology. The Kiva, 32(3):96-101.

Metcalf, Michael D.

- 1973 Archaeology at Dipper Gap: An Archaic campsite, Logan County, Colorado. Master's thesis, Colorado State University. Fort Collins
- 1974 Preliminary Report on an Archaeological Survey of Two Pasco Pipeline Projects in Central Wyoming. Report prepared for Pasco Incorporated by the Wyoming Recreation Commission.
- 1975 Archaeological Investigations at the Black Butte Mine, Sweetwater County, Wyoming. Rock Springs: Western Wyoming College.

- 1976a An Archaeological Sampling Survey of the Sandy, Green Mountain, and Ferris-Seven Lakes EIS Areas, Southwestern Wyoming, 1976. Western Wyoming College Occasional Papers, No. 5. Rock Springs.
- 1976b An Archaeological Survey of the South Haystack Project, Uinta County, Wyoming. Western Wyoming College Occasional Papers, No. 8. Rock Springs.
- 1977a Preliminary Draft of an Archaeological Survey of the Long Canyon Project, Sweetwater County, Wyoming. Report prepared for the Rocky Mountain Energy Company by Western Wyoming College. Rock Springs.
- 1977b An Archaeological Sampling Survey of the Sweetwater-Kemmerer Hanna-Atlantic Rim Coal ES Area. Western Wyoming College Occasional Papers, No. 10. Rock Springs.
- 1981 Archaeological Investigations at the Proposed South Haystack Mine, Uinta County, Wyoming, 1976-1977-1978. Metcalf-Zier Archaeologists, Inc. Eagle, Colorado.

Metcalf, Michael D., and J. L. Anderson, (eds.)

- 1982 Final Report on the 1980 Archaeological Site Testing and Evaluation for MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, Spread 6, Lincoln Sweetwater, and Uinta Counties, Wyoming. In preparation for Woodward-Clyde by Pioneer/Metcalf-Zier.

Metcalf, Michael D., and Patricia Treat

- 1979 Continuity in Late Prehistoric Period pronghorn procurement in southwest Wyoming. Paper presented at the Society for American Archaeology, 44th Annual Meeting, Vancouver, British Columbia.

Miller, J. C.

- 1981 Overview of the interior Green River Basin. The 1980 End of Year Report. Report prepared for the Bureau of Land Management, submitted by Western Wyoming College. Rock Springs.

Miller, Mark E.

- 1976 Communal bison procurement during the Middle Plains Archaic: A comparative study. Master's thesis, University of Wyoming. Laramie.

Miller, Wick R.

- 1964 Anthropological linguistics in the Great Basin. Paper presented at the Symposium on the Status of Great Basin Research, Great Basin Anthropological Conference, September, 1964. Reno.

Mooney, James

- 1893 Calendar history of the Kiowa Indians. Bureau of Ethnology, 17th Annual Report.

Morgan, E. Grace

- 1980 Bison movement patterns on the Canadian Plains: An ecological analysis. Plains Anthropologist, 25(88, Pt. 1):143-160.

Morse, Noel

- 1931 The Ancient Culture of the Fremont River in Utah. Papers of the Peabody Museum of Archaeology and Ethnology, 12(3). Cambridge, MA.
- 1934 Clay figurines of the American Southwest. Papers of the Peabody Museum of Archaeology and Ethnology, 49(1). Cambridge, MA.

Moss, John H., et al.

- 1951b Glaciation in the Wind River Mountains and its relation to early man in the Eden Valley, Wyoming. In Early Man in the Eden Valley. John H. Moss et al., eds. University of Pennsylvania, The University Museum, Museum Monographs.

Moss, John H., et al. (eds.)

- 1951a Early Man in the Eden Valley. University of Pennsylvania, The University Museum, Museum Monographs.

Müller-Beck, Hansjürgen

- 1966 Paleohunters in America: Origins and diffusion. Science, 152:1191-1200.

Mulloy, William T.

- 1942 The Hagen Site: A prehistoric village on the Upper Yellowstone. University of Montana Publications in the Social Sciences, No. 1. Missoula.
- 1943 A prehistoric campsite near Red Lodge, Montana. American Antiquity, 9(2):170-179.
- 1952 The Northern Plains. Archaeology of the Eastern United States. J. B. Griffin, ed. Pp. 124-138. Chicago: University of Chicago Press.
- 1953 The Ash Coulee site. American Antiquity, 19(1):73-75.
- 1954a Archaeological Investigations in the Shoshone Basin of Wyoming. University of Wyoming Publications, 18(1). Laramie.
- 1954b The McKean site in northwestern Wyoming. Southwestern Journal of Anthropology, 10(3):432-460.
- 1958 A Preliminary Historical Outline for the Northwestern Plains. University of Wyoming Publications, 22(1). Laramie.
- 1959 The James Allen site near Laramie, Wyoming. American Antiquity, 23(1):112-116.
- 1963a Archaeological Investigations along the Northern Platte River in Eastern Wyoming. University of Wyoming Publications, 31(2):24-51. Laramie.

1965b The Indian village at Thirty-Mile Mesa, Montana. University of Wyoming Publications, 31(1):1-21.

Mulloy, William T., and Oscar Lewis

1943 Some early types of points from the Lower Yellowstone country. American Antiquity, 8(3):298-299.

Mulloy, William T., and Louis C. Steege

1967 Continued archaeological investigations along the North Platte River in eastern Wyoming. University of Wyoming Publications, 33(3):169-233.

Murray, Robert A.

1968 Military Posts in the Powder River Country of Wyoming, Lincoln: University of Nebraska Press.

1974 Military Posts of Wyoming. Fort Collins, CO: Old Army Press.

1978a Cultural Resources (Historic) Inventory of the Casper District, Wyoming, Bureau of Land Management; V.I.: Narrative of Human Occupation and Use Analysis. Sheridan, WY.

1978b Cultural Resource (Historic) Inventory. Manuscript on file, Bureau of Land Management District Office, Worland, Wyoming.

1979a Class I Historic Cultural Resource Inventory for the Rock Springs District, Bureau of Land Management; V.I.: Human Occupation and Use Narrative. Sheridan, WY.

1979b Class I Historic Cultural Resource Inventory for the Rawlins District, Bureau of Land Management; V.I.: Human Occupation and Use Narrative. Sheridan, WY.

Nelson, Charles E.

1967 Archeology of Hall-Woodland Cave. Southwestern Lore, 33(1):1-13.

Nero, Robert W.

1957 A surface collection from the Klein site at Melfort. The Blue Jay, 15(2):88-90.

Nero, Robert W., and Bruce A. McCorquodale

1958 Report on an excavation at the Oxbow Dam site. The Blue Jay, 16(2):82-92.

Newcomb, W. W.

1950 A re-examination of the causes of Plains warfare. American Anthropologist, 52(3):317-330.

Nimmo, Barry W.

- 1971 Population dynamics of a Wyoming pronghorn cohort from the Eden-Parson site, 48SW304. Plains Anthropologist, 16(54):285-288.

No Author

- n.d. The Coal Industry of Sweetwater County. Unpublished manuscript, Hebard Collection, File #W994-5-rs. Laramie: University of Wyoming, Western Historic Research Collection (WHRC).

O'Connell, James F.

- 1967 Elko Eared/Elko Corner-notched projectile points as time markers in the Great Basin. Reports of the University of California Archaeological Survey, 70:129-140.

Oliver, Symmes C.

- 1962 Ecology and cultural continuity as contributing factors in the social organization of the Plains Indian. University of California Publications in American Archaeology and Ethnology, 48:1-90.

Oriel, Steven S., and Joshua I. Tracey, Jr.

- 1970 Uppermost Cretaceous and Tertiary stratigraphy of Fossil Basin, southwestern Wyoming. Geological Survey Professional Paper 635.

Osborne, H. F.

- 1922 Species of American Pleistocene mammoths, Elephas jeffersoni. American Museum Novitates, 152:1-7.

Osborne, Douglas, Alan Bryan, and Robert H. Crabtree

- 1961 The Sheep Island site and the Mid-Columbia Valley. Bureau of American Ethnology, Bulletin, No. 179, River Basin Survey Papers, No. 24.

Over, William H.

- 1936 The archaeology of Ludlow Cave and its significance. American Antiquity, 2:126-129.

Parker, Ronald B., and Heinrich Toots

- 1974 Minor elements in fossil bone: Applications to Quaternary samples. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Peebles, T. C.

- 1982 A Class II Cultural Resource Inventory of the Eastern Powder River Basin, Wyoming. Eagle, CO: Metcalf-Zier Archaeologists, Inc.

Pendergast, David M.

1961 Excavations at the Bear River Site, Box Elder County, Utah. Utah Archeology, Newsletter of the Utah Statewide Archeological Society, 7(2). Salt Lake City.

1963 Addendum I: Lithic materials from southwestern Wyoming and northeastern Utah. In Archaeological Survey of the Flaming Gorge Reservoir Area, Wyoming-Utah. Kent C. Day and David S. Dibble, eds. University of Utah Anthropological Papers, No. 65, Upper Colorado Series, 9:1-16. Salt Lake City.

Peterson, Robert R., Jr.

1978 Projectile point re-utilization patterns at the Agate Basin site. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:139-147.

Peterson, Robert, Danny Walker, and George Ziemens

1977 Results of an archaeological survey along portions of U. S. Highway 27/287 between Riverton and Dubois, Wyoming. Unpublished report on file, Department of Anthropology, University of Wyoming. Laramie.

Phillips, Paul C.

1961 The Fur Trade. Norman: University of Oklahoma Press.

Pochop, Larry O.

1977 Growing degree days in Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, B-655.

Pochop, Larry O., and John D. Alyea

n.d. Probability of sequences of wet and dry days for 11 western states and Texas. University of Wyoming Agricultural Experiment Station Research Journal, 50.

Pochop, Larry O., V. E. Smith, and John D. Alyea

1979 Heating and cooling days in Wyoming. University of Wyoming Agricultural Experiment Station Bulletin, B-677.

Porter, C. L.

1962a A flora of Wyoming: Part I. University of Wyoming Agricultural Experiment Station Bulletin, No. 402.

1962b Vegetation zones of Wyoming. University of Wyoming Publications, 27(2):6-12.

1963 A flora of Wyoming: Part II. University of Wyoming Agricultural Experiment Station Bulletin, No. 404.

- 1964 A flora of Wyoming: Part III. University of Wyoming Agricultural Experiment Station Bulletin, No. 418.
- 1965 A flora of Wyoming: Part IV. University of Wyoming Agricultural Experiment Station Bulletin, No. 434.
- 1967 A flora of Wyoming: Part V. University of Wyoming Agricultural Experiment Station Research Journal, No. 14.
- 1968 A flora of Wyoming: Part VI. University of Wyoming Agricultural Experiment Station Research Journal, No. 20.
- 1972a A flora of Wyoming: Part VII. University of Wyoming Agricultural Experiment Station Research Journal, No. 64.
- 1972b A flora of Wyoming: Part VIII. University of Wyoming Agricultural Experiment Station Research Journal, No. 65.

Purdy, William M.

- 1959 An outline of the history of the Flaming Gorge Reservoir Area. University of Utah Anthropological Papers, No. 1, Upper Colorado Series, No. 1. Salt Lake City.

Quigg, J. Michael

- 1978 Winter bison procurement in southwestern Alberta. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Randall, Art

- 1963 Correlation of the Lee Site artifact type with quarry sites. Wyoming Archaeologist, 7(1):3-11.

Rauzi, Frank, and Robert L. Treslar

- 1978 A preliminary report on herbage yields, stand evaluation, soils, and chemical content of selected grasses and a legume grown on topsoil, White River and Wind River geologic materials. University of Wyoming Agricultural Experiment Station Research Journal, No. 124.

Reed, Eric K.

- 1955 Human skeletal remains from the Turner-Look site. A reappraisal of the Fremont culture. H. M. Wormington, ed. Proceedings of the Denver Museum of Natural History, No. 1.
- 1965 Human skeletons from two Fremont sites in Utah. Manuscript on file, Department of Anthropology, University of Utah. Salt Lake City.
- 1966 Skeletons from the Injun Creek site. Appendix-Fremont-Promontory-Plains Relationships. C. Melvin Aikens, ed. University of Utah Anthropological Papers, 82:95-102.

Reeve, Stuart A.

- 1976 Prehistoric transhumance in Jackson Hole, Wyoming. Manuscript on file, Midwest Archeological Center, National Park Service, Lincoln, Nebraska.

Reeves, Brian O. K.

- 1969 The southern Alberta paleo-cultural-paleo-environmental sequence. In Post-Pleistocene Man and His Environment on the Northern Plains. R. G. Forbis, L. B. Davis, O. A. Christensen, and G. Fedirchuk, eds. Proceedings of the First Annual Paleo-environmental Workshop, University of Calgary Anthropological Association.
- 1970 Culture Change in the Northern Plains 1000 B.C.-A.D. 1000. Ph.D. dissertation, University of Calgary, Alberta.
- 1974 Head-Smashed-In: 5500 years of bison jumping in the Alberta Plains. Paper presented at the Thirty-second Plains Anthropological Conference at Laramie, Wyoming. November, 1974.
- 1978a Bison killing in the southwestern Alberta Rockies. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1978b Head-Smashed-In: 5500 years of bison jumping in the Alberta Plains. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Reeves, Brian, O. K., and J. F. Dormar

- 1972 A partial Holocene pedological and archaeological record from the southern Alberta Rocky Mountains. Arctic and Alpine Research, 4(4):325-336.

Regan, Albert B.

- 1934 Some notes on the history of the Uinta Basin in northeastern Utah, to 1850. Utah Academy of Science, Arts, and Letters, 11:55-64. Salt Lake City.

Reher, Charles A.

- 1970 Population dynamics of the Glenrock Bison bison population. In the Glenrock Buffalo Jump, 48C0304. George C. Frison, ed. Plains Anthropologist Memoir, No. 7, Appendix.
- 1971 A survey of ceramic sites in southwestern Wyoming. Master's thesis, University of Wyoming. Laramie.
- 1973 The Wardell Bison bison sample: Population dynamics and archaeological interpretation. In The Wardell Buffalo Trap 48SU301: Communal Procurement in the Upper Green River Basin, Wyoming. George C. Frison, ed. University of Michigan, Anthropological Papers, No. 48, Appendix.

- 1974a Buffalo population and other deterministic factors in a model of adaptive process in the shortgrass Plains. Paper presented at the Thirty-second Plains Conference at Laramie, Wyoming, November, 1974.
- 1974b Population study of the Casper site bison. The Casper Site: A Hell Gap Bison Kill Site on the High Plains. George C. Frison, ed. New York: Academic Press.
- 1977 Adaptive process on the shortgrass Plains. For Theory Building in Archaeology. Lewis R. Binford, ed. New York: Academic Press.
- 1978a Adaptive process on the shortgrass Plains: Evidence from the late prehistoric Black Hills of Wyoming. Ph.D. dissertation, University of New Mexico. Albuquerque.
- 1978b Buffalo population and other deterministic factors in a model of adaptive process on the shortgrass Plains. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1978c The Western Powder River Basin Survey: Preliminary Research Design. Report prepared for the Bureau of Land Management in partial fulfillment of Contract # YA-512-CT7-233.
- 1979 The Western Powder River Survey Report on Survey Results. Report submitted to the Bureau of Land Management by the Office of the Wyoming State Archaeologist. (Contract # YA-512-CT7-233).
- n.d.a Dendrochronological research in Wyoming. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.
- n.d.b Discussion of regional patterning in settlement systems of the Western Archaic. Paper presented at the Thirty-third Plains Conference, Lincoln. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.
- n.d.c Paleoecological reconstruction and the analysis of subfossil bison populations: The Jones-Miller extinct Bison. Manuscript on file, The Smithsonian Institution. Washington.
- n.d.d Adaptive process on the western Plains. In Research in the Wyoming Black Hills. Richard Klein and James Brown, eds. American Antiquity Memoir, in preparation.

Reher, Charles A., and George C. Frison

- 1980 The Vore site 48CK302: A stratified buffalo jump in the Black Hills of northeastern Wyoming. Plains Anthropologist Memoir, in preparation.

Reider, Richard G., Nelson J. Kuniansky, David M. Stiller, and Peter J. Uhl

- 1974 Preliminary investigation of comparative soil development on Pleistocene and Holocene geomorphic surfaces of the Laramie Basin, Wyoming. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Renaud, Etienne B.

- 1932 Archaeological Survey of Eastern Wyoming, Summer, 1931. University of Denver, Department of Anthropology, and University of Wyoming.
- 1936a The Archaeological Survey of the High Western Plains Southern Wyoming and Southwest South Dakota, Seventh Report. Department of Anthropology, University of Denver.
- 1936b Pictographs and Petroglyphs of the High Western Plains. The Archaeological Survey of the High Western Plains-Eighth Report. Department of Anthropology, University of Denver.
- 1933 The Blacks Fork Culture of Southwest Wyoming. The Archaeological Survey of the High Western Plains, Tenth Report. Department of Anthropology, University of Denver.
- 1940 Further Research in the Blacks Fork Basin, Southwest Wyoming. The Archaeological Survey of the High Western Plains, Twelfth Report. Department of Anthropology, University of Denver.
- 1947 Archaeology of the High Western Plains. Seventeen Years of Archaeological Research. Department of Anthropology, University of Denver.

Reynolds, William E.

- 1983 The archaeology and history of the La Barge area, southwestern Wyoming, a Class II cultural resources inventory. Report prepared for the Bureau of Land Management, Rock Springs District.

Roberts, Frank H. H., Jr.

- 1935a A Folsom complex: A preliminary report on investigations at the Lindenmeier site in northern Colorado. Smithsonian Miscellaneous Collections, 94:1-35.
- 1935b A survey of southwestern archeology. American Anthropologist, 37(1):1-35.
- 1936 Additional information on the Folsom complex. Smithsonian Miscellaneous Collections, 95:1-3.
- 1943 A new site. American Antiquity, 8(3):300.
- 1951 The early Americans. Scientific American, 184(2):15-19.
- 1961 The Agate Basin Complex. Homenaje a Pablo Martinez del Rio. Mexico: Instituto Nacional de Anthropologia y Historia.

- 1962 1961 excavations at Agate Basin, Wyoming. In Paleo-Indian and Archaic Traditions. Plains Anthropologist, 7(16):89-91.
- Robinson, Charles J., and T. R. Cummings
1963 Ground-water resources and geology of the Lyman-Mountain View area, Uinta County, Wyoming. Geological Survey Water-Supply Paper, 1669-E.
- Roe, Frank Gilbert
1950 The North American Buffalo. Toronto: University of Toronto Press.
- Rogers, Fred B.
1935 Soldiers of the Overland. San Francisco: (publisher unknown).
- Rogers, Malcolm J.
1958 San Dieguito implements from the terrace of the Rincon-Pantano and Rillito drainage systems. The Kiva, 24(1):1-4.
- Rollins, Philip Ashton (ed.)
1935 The Discovery of the Oregon Trail: Robert Stuart's Narratives. New York: Charles Scribner's.
- Root, Forrest K., Gary B. Glass, and Donald W. Lane
1973 Sweetwater County: Geologic Map Atlas and Summary of Economic Mineral Resources. County Resource Series, No. 2. Laramie: Geological Survey of Wyoming.
- Roth, Don
n.d. Winter injury to trees and shrubs in Wyoming. University of Wyoming Agricultural Extension Service Bulletin, B-716.
- Rubey, William W., Steven S. Oriel, and Joshua I Tracey, Jr.
1975 Geology of Sage and Kemmerer 15-minute Quadrangles, Lincoln County, Wyoming. Geological Survey Professional Paper, 885.
- Rudy, Jack R.
1953 Archeological Survey of Western Utah. University of Utah Anthropological Papers, No. 12. Salt Lake City.
- Rudy, Jack R., and Earl Stoddard
1954 Site on Fremont Island in Great Salt Lake. American Antiquity, 19(3):285-290.

Russell, Osborne

1921 Journal of a Trapper of Nine Years in the Rocky Mountains 1834-1843.
Boise: Syms-York.

1970 Journal of a Trapper. Lincoln: University of Nebraska Press. (edited version of the 1921 manuscript).

Sadek-Koros, Hind

1972 The sediments and fauna of Jaguar Cave: I-The sediments. Tebiwa, 15(1):1-20.

Sanders, Paul

1978 Analysis of the marmot population from Little Canyon Creek Cave. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:52-60.

Sanders, Paul H., and Thomas K. Larson

1981 Report on the results of an intensive cultural resource inventory conducted for the Kemmerer Industrial Park (L/T-13-81). Laramie: Larson-Tibesar Associates.

Satterthwaite, Linton, Jr.

1951 The temporal association of the artifacts with the Middle Sand. In Early Man in the Eden Valley. John H. Moss et al. University of Pennsylvania, The University Museum, Museum Monographs.

1957 Stone artifacts at and near the Vinley Site, near Eden, Wyoming. University of Pennsylvania, The University Museum, Museum Monographs.

Saunders, Roger S., and John T. Penman

1979 Perry Ranch: A Plainview bison kill on the Southern Plains. Plains Anthropologist, 23(83):1-20.

Schaeffer, Claude E.

1978 The bison drive of the Blackfeet Indians. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Schock, Susan D.

1979 Archaeological Reconnaissance of Stauffer Chemical Company's Overthrust Extension Pipeline. Rock Springs: Western Wyoming College.

Schock, Susan D., Ian Von Essen, Steven D. Creasman, Janice Newberry-Creasman, A. Dudley Gardner, Linda Scott, and Douglas Kullen

1982 The Cow Hollow Creek site: A multi-component campsite in the Green River Basin, Wyoming. Journal of Intermountain Archaeology, 1(2):100-121.

Schroeder, Albert H.

- 1963 Comment on Gunnerson's "Plateau Shoshonean Prehistory." American Antiquity, 28(4):559-560.

Schulman, Edmund

- 1948 Dendrochronology in northeastern Utah. Tree Ring Bulletin, 15(1 & 2).

Schultz, C. Bertrand

- 1943 Some artifact sites of early man in the Great Plains and adjacent areas. American Antiquity, 8(3):242-249.

Schultz, C. Bertrand, and Loren Risley

- 1935 Paleontological evidence of the antiquity of the Scottsbluff Bison Quarry and its associated artifacts. American Anthropologist, 37(2):306-319.

- 1936 An added note on the Scottsbluff Quarry. American Anthropologist, 38(3):521-524.

Schultz, C. Bertrand, and W. D. Frankforter

- 1951 A preliminary report on the bison remains from the Findley site, (Eden bison quarry). In Early Man in the Eden Valley. John H. Moss et al., eds. University of Pennsylvania, The University Museum, Museum Monographs.

Schumm, S. A., and R. F. Hadley

- 1957 Arroyos and the semi-arid cycle of erosion. American Journal of Science, 255:161-174.

Schweigert, Kurt P.

- 1981 Historical overview of the Ham's Fork region. In The 1981 Cultural Resource Inventory of the Kemmerer Coal Company Elkol-Sorenson South Block Mine. Thomas K. Larson, Paul H. Sanders, Carl Spath, and Keith Dueholm. Laramie: Larson-Tibesar Associates.

Secoy, Frank R.

- 1951 The identity of the Padouca: An ethnohistorical analysis. American Anthropologist, 53(4):525-541.

- 1953 Changing military patterns on the Great Plains. Monographs of the American Ethnological Society, No. 21.

Sellards, E. H.

- 1955 Fossil bison and associated artifacts from Milnesand, New Mexico. American Antiquity, 20(4):336-344.

Sellards, E. H., Glen L. Evans, and Grayson E. Meade

- 1947 Fossil bison and associated artifacts from Plainview, Texas, with description of artifacts by Alex D. Krieger. Bulletin of Geological Society of America, 58:927-954.

Seltzer, Carl C.

- 1944 Racial Prehistory in the Southwest and the Navikuh Zunis. Papers of the Peabody Museum of Archaeology and Ethnology, 23(1). Cambridge, MA.

Severson, Keith, Morton May, and William Hepworth

- 1980 Food Preferences, Carrying Capacities, and Forage Competition Between Antelope and Domestic Sheep in Wyoming's Red Desert. University of Wyoming Agricultural Experiment Station SM10.

Sharrock, Floyd W.

- 1966 Prehistoric Occupation Patterns in Southwest Wyoming and Cultural Relations with the Great Basin and Plains Culture Areas. University of Utah Anthropological Papers, No. 77. Salt Lake City.

Sharrock, Floyd W., and John P. Harvitt

- 1967 Excavations at Nephi, Utah, 1965-1966. University of Utah Anthropological Papers, No. 88. Salt Lake City.

Shay, C. Thomas

- 1978a Bison procurement on the eastern margins of the Plains: The Itasca site. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1978b Late prehistoric bison and deer use in the eastern prairie-forest border. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Shelford, Victor E.

- 1964 The Ecology of North America. Urbana, IL: University of Illinois Press.

Shields, Wayne F.

- 1967 1966 excavations: Uinta Basin. Miscellaneous Papers, No. 22, University of Utah Anthropological Papers, 89:vii-32. Salt Lake City.

Shields, Wayne F., and Gardin F. Dalley

- 1968 The Bear River No. 3 Site: Miscellaneous Papers, No. 22, University of Utah Anthropological Papers, No. 99. Salt Lake City.

Shimkin, D. B.

- 1940 Shoshone-Comanche origins and migrations. Proceedings of the Sixth Pacific Science Conference of the Pacific Science Association, 4:17-25.
- 1942 Dynamics of recent Wind River Shoshone history. American Anthropologist, 44(3):451-462.
- 1947 Wind River Shoshone Ethnogeography. University of California Anthropological Records, 5(4). Berkeley.

Shiner, Joel L.

- 1961 The McNary Reservoir, a Study in Plateau Archaeology. Bureau of American Ethnology Bulletin, No. 179, River Basin Surveys Papers, No. 12.

Shippee, J. M.

- 1971 Wickiups of Yellowstone Park. Plains Anthropologist, 16(51):74-75.

Sieber, E. T. (ed.)

- 1951 My Sixty Years on the Plains. (by William Thomas Hilton). Columbus: Long's College Book Company.

Simpson, Tana

- 1974 Population dynamics of mule deer (Odocoileus hemionus) from the Dead Indian site. Unpublished manuscript on file, Department of Anthropology, University of Wyoming.

Smiley, F. E.

- 1978 Changes in the cursorial ability of Wyoming Holocene bison. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:105-126.

Smith, Anne M.

- 1974 Ethnography of the Northern Utes. Papers in Anthropology, No. 17. Albuquerque: Museum of New Mexico Press.

Smith, Elmer R.

- 1940 Areas of prehistoric and historical settlement in Utah. Proceedings of the Utah Academy of Science, Arts, and Letters, 17:18. Salt Lake City.
- 1942 An Indian burial, a barbed bone "projectile point", and accompanying artifacts from Bear Lake, Idaho. Archaeology and Ethnology Paper of the Museum of Anthropology, University of Utah, No. 6. Reprinted 1950, University of Utah Anthropological Papers, Nos. 1-9. Salt Lake City.
- 1952 The Archeology of Deadman Cave, Utah: A revision. University of Utah Anthropological Papers, No. 10. (original version published in 1941). Salt Lake City.

Smith, Janet Hugie

- 1972 Native pharmacopoeia of the eastern Great Basin: A report of work in progress. In Great Basin Cultural Ecology: A Symposium. Don. D. Fowler, ed. Desert Research Institute, Publications in the Social Sciences, 8:73-87. Reno and Las Vegas.

Smith, Marian W.

- 1950 Archaeology of the Columbia-Fraser Region. Memoirs of the Society for American Archaeology, No. 6.

Smith, Sharon K.

- 1970 A preliminary report on the Dead Indian site 48PA551. Wyoming Archaeologist, 13(1):25-32.

Smith, S. J.

- 1981 Class I Prehistoric Resource Inventory, Union Energy Mining Division ENQ Uranium Project, Sweetwater County, Wyoming. Report prepared for Union Energy Mining Division by Nickens and Associates, Montrose, CO.

Sneed, Paul G.

- 1967 An archaeological reconnaissance of the Craters of the Moon National Monument. Tebiwa, 10(1):37-52.

Sollberg, J. B.

- 1971 A technological study of beveled knives. Plains Anthropologist, 16:209-218.

Sowers, Ted C.

- 1941 The Wyoming Archaeological Survey. Report of the Federal Works Project Administration. Laramie.

Spaulding, Albert C.

- 1948 Review of Archaeology of the High Western Plains. Seventeen Years of Archaeological Research by Etienne Renaud. American Antiquity, 13(3):262-263.

Speer, Roberta D.

- 1978 Bison remains from the Rex Rodgers site. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Stanford, Dennis

- 1974 Preliminary report of the excavations of the Jones-Miller Hell Gap site, Yuma County, Colorado. Southwestern Lore, 40(384):30-36.

- 1978 The Jones-Miller site: An example of Hell Gap bison procurement strategy. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Steege, Louis C.

- 1960 A probable Middle Period burial in Wyoming. Plains Anthropologist, 5(10):82-83.

- 1976 Happy Hollow Rockshelter. Wyoming Archaeologist, 10(3):11-23.

Steidtmann, J. R.

- 1973 Ice and snow in eolian sand dunes of southwestern Wyoming. Science, 179:796-799.

- 1974 Cross-stratification in Holocene sands. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

Stevens, E. H.

- 1940 Geological Report. The Archaeological Survey of the High Western Plains, Twelfth Report. Etienne B. Renaud. Pp. 14-17. Department of Anthropology, University of Denver.

Steward, Julian H.

- 1933 Early Inhabitants of Western Utah, Part I, Mounds and House Types. University of Utah Bulletin, 23(7). Salt Lake City.

- 1936 Pueblo Material Culture in Western Utah. University of New Mexico Bulletin, No. 287, Anthropological Series, 1(3). Albuquerque.

- 1937 Ancient Caves of the Great Salt Lake Region. Bureau of American Ethnology Bulletin, No. 116.

- 1938 Basin-Plateau Aboriginal Sociopolitical Groups. Bureau of American Ethnology Bulletin, No. 120.

- 1940 Native cultures of the Intermontane (Great Basin) area. In Essays in Historical Anthropology. Smithsonian Miscellaneous Collections, 100:445-502.

Stewart, T. Dale

- 1940 Footnote, pg. 471, in Native cultures of the Intermontane (Great Basin) area. In Essays in Historical Anthropology. Smithsonian Miscellaneous Collections, 100:445-502.

- 1954 The lower level human skull. In The McKean site in western Wyoming. William Mulloy. Southwestern Journal of Anthropology, 10(4):457-459.

Stone, Elizabeth A.

1924 Uinta County, Its Place in History. Laramie: Laramie Publishing Co.

Strong, William Duncan

1940 From History to Prehistory in the Northern Great Plains. Smithsonian Miscellaneous Collections, 100:353-394.

Suhm, Dee Ann

1959 A Report of Investigations at Two Archaeological Sites in the Flaming Gorge Reservoir Area, Daggett County, Utah. Department of Anthropology, University of Utah. Salt Lake City. (mimeographed report).

Sunder, John E.

1954 Report of a Journey to the Rocky Mountains: With Stuart and Sublette in the West. Bulletin of the Missouri Historical Society, 11:41-53.

Swain, Charles R.

1975 A survey of Trail Lake petroglyphs. Master's thesis, University of Wyoming. Laramie.

Swanson, Earl H., Jr.

1961 Folsom man in Idaho. Idaho Yesterdays, 5(1):26-30.

1962a Early cultures in northwestern America. American Antiquity, 28(2):151-158.

1962b The Emergence of Plateau Culture. Occasional Papers of the Idaho State College Museum. No. 14. Pocatello.

1966 The geographic foundations of the Desert Culture. In The Current Status of Anthropological Research in the Great Basin: 1964. Warren L. D'Azevedo et al., eds. Desert Research Institute Social Sciences and Humanities Publications. 1:137-146.

1972 Birch Creek. Pocatello: Idaho State University Press.

Swanson, Earl H., Jr., and Alan Lyle Bryan

1964 Birch Creek Papers No. 1, An Archaeological Reconnaissance in the Birch Creek Valley of Eastern Idaho. Occasional Papers of the Idaho State University Museum, No. 13. Pocatello.

Swanson, Earl H., Jr., B. Robert Butler, and Robson Bonnicksen

1964 Birch Creek Papers No. 2, Natural and Cultural Stratigraphy in the Birch Creek Valley of Eastern Idaho. Occasional Papers of the Idaho State University Museum, No 14. Pocatello.

- Swanson, Earl H., Jr., Chester King, and James Chatters
1969 A settlement pattern in the foothills of east-central Idaho. Tebiwa, 12(1):31-38.
- Swanson, Earl H., Jr., Roger Powers, and Alan Lyle Bryan
1964 The material culture of the 1959 Southwestern Idaho Survey. Tebiwa, 7(2):1-27.
- Swanson, Earl H., Jr., and Anthony J. Ranere
1970 Railroad Ranch prehistory. Idaho Yesterdays, 13(4):19-27.
- Swanson, Earl H., Jr., and Paul G. Sneed
1966 Birch Creek Papers No. 3: The Archaeology of the Shoup Rock Shelters in East-Central Idaho. Occasional Papers of the Idaho State university Museum, No. 17. Pocatello.
1967 An archaeological reconnaissance of the Railroad Ranch in eastern Idaho. Tebiwa, 10(1):53-59.
1971 Jackknife Cave. Tebiwa, 14(1):33-69.
- Swanson, Earl H., Jr., Donald Tuohy, and Alan Lyle Bryan
1959 Archaeological Exploration in Central and Southern Idaho-1958. Occasional Papers of the Idaho State University Museum, No. 2. Pocatello.
- Syys, L.
1969 The McKean Complex as a horizon marker in Manitoba and on the northern Great Plains. Master's thesis, University of Manitoba. Winnipeg.
- Tanner, Russell L., and Barbara J. Hickman
1980 Final Report of the Kemmerer Coal Company, Elkol-Sorenson Mine Expansion Plan Archaeological Survey. Rock Springs: Western Wyoming College.
- Taylor, Dee C.
1957 Two Fremont Sites and Their Position in Southwestern Prehistory. University of Utah Anthropological Papers, No. 29. Salt Lake City.
- Tibeser, William L., and Thomas K. Larson
1980 An Intensive Cultural Resources Inventory of the Kemmerer Coal Company, North Block, Lincoln County, Wyoming. Laramie: Larson-Tibeser Associates.

Todd, Lawrence C., Jr., and Jack L. Hofman

- 1978 A Study of Bison Mandibles from the Horner and Findley Sites: Two Paleo-Indian Bison Kills in Wyoming. University of Wyoming Publications, XXXII(1), Wyoming Contributions to Anthropology, 1:67-104.

Towne, Charles W., and Edward N. Wentworth

- 1945 Shepherd's Empire. Norman: University of Oklahoma Press.

Train, Percy, et al.

- 1941 Medicinal Uses of Plants by Indian Tribes of Nevada. Contributions Toward a Flora of Nevada, No. 33. U. S. Department of Agriculture, Bureau of Plants Industry. (mimeographed report).

Treat, Patricia

- 1978 An Archaeological Survey of North Baxter Basin, Sweetwater County, Wyoming. Rock Springs: Western Wyoming College.
- 1980 Task I: Base Data and Research Design for the Class II Cultural Resource Inventory, Salt Wells Resource Area, Wyoming. Report submitted to the Bureau of Land Management by Western Wyoming College (Contract Number YA-512-CT9-201).
- 1981 1980 End of Year Report. Report prepared for the Bureau of Land Management by Archaeological Services, Western Wyoming College, pp. 4-26.

Treat, Patricia, and Russell L. Tanner

- 1981 Results of the Class II Resource Inventory for the Salt Wells Resource Area, Sweetwater County, Wyoming. Report submitted to the Bureau of Land Management by Western Wyoming College (Contract Number YA-512-CT9-201).

Treat, Patricia, Russell L. Tanner, and Barbara J. Hickman

- 1979 Archaeological Investigations in the Moxa Arch and Big Piney Gathering Systems, Southwestern Wyoming. Technical Report, Western Wyoming College. Rock Springs.

Tripp, George W.

- 1956 A Clovis point from central Utah. American Antiquity, 31(3):435-436.

Tucker, G. V.

- 1982 Geoarchaeology of sand dunes in southwest Wyoming. In Report on 1980 Archaeological Site Testing and Evaluation for MAPCO's Rocky Mountain Liquid Hydrocarbons Pipeline, Spread 6, Lincoln, Uinta, and Sweetwater Counties, Wyoming. M. Metcalf and J. Anderson, eds. Report prepared for Woodward-Clyde Consultants by Pioneer/Metcalf-Zier Archaeologists.

Turney-High, Harry H.

1933 Cooking camas and bitterroot. Scientific Monthly, 36:262-263.

Union Pacific Coal Company

1940 History of the Union Pacific Coal Mines, 1868-1940. Omaha: Colonial Press.

Unruh, John D., Jr.

1979 The Plains Across: The Overland Emigrants and the Trans-Mississippi West, 1840-1860. Urbana: University of Illinois Press.

Unterman, G. E., and B. R. Unterman

1954 Geology of Dinosaur National Monument and Vicinity, Utah-Colorado. Utah Geological and Mineralogical Survey Bulletin, No. 42.

Vietti, John S.

1974 Structural geology of Ryckman Creek anticline area, Lincoln and Uinta Counties, Wyoming. Master's thesis, Department of Geology, University of Wyoming. Laramie.

Vosika-Pastor, Jana, and Rhoda Owen Lewis

1981 Archaeological Investigations in Long and Crooked Canyons, Long Canyon Project, Sweetwater County, Wyoming. Report prepared for Sunoco Energy Development Company by Metcalf-Zier Archaeologists, Inc.

Waitkus, Brian R.

1981 An Archaeological Survey of Proposed Drill Holes for Rocky Mountain Energy Company in the Latham Area, Sweetwater County, Wyoming. Report prepared for Rocky Mountain Energy Company by Metcalf-Zier Archaeologists, Inc.

Waitkus, Brian R., and Mary Lou Taylor

1981 Archaeological Survey and Test Excavations at the Skull Point Mine Expansion Area, Lincoln County, Wyoming. Eagle, CO: Metcalf-Zier Archaeologists, Inc.

Walker, Cecil L.

1943 Geology of the Cumberland Reservoir-Little Muddy Creek Area, Lincoln and Uinta Counties, Wyoming. Master's thesis, Department of Geology, University of Wyoming. Laramie.

Walker, Danny W.

1975a A cultural and ecological analysis of the vertebrate fauna of the Medicine Lodge Creek site (48BH499). Master's thesis, University of Wyoming. Laramie.

- 1975b Non-bison remains from the Vore Bison Jump, Crook County, Wyoming.
Plains Anthropologist, 20(69):217-224.

Walker, Danny N., and George M. Ziemens

- 1976 Results of an archaeological survey of the Arch Mineral Corporation
Seminole Number One Mine, Hanna, Wyoming. Manuscript on file, Department
of Anthropology, University of Wyoming. Laramie.

- n.d. Archaeological investigations at 48FR115, Fremont County, Wyoming.
Manuscript on file, Department of Anthropology, University of Wyoming.
Laramie.

Walker, Danny N., George M. Ziemens, Larry A. Lahren, Jason Lillegraven, and
Jeffrey Eaton

- 1977 Results of a cultural resource inventory of the Pacific Power and Light
Jim Bridger Mine, Point of Rocks, Wyoming. Department of Anthropology,
University of Wyoming. Laramie.

Ware, Eugene Fitch

- 1960 The Indian War of 1864. New York: St. Martin's Press.

Warren, Claude N.

- 1968 The View from Wenas: A Study in Plateau Prehistory. Occasional Papers
of the Idaho State University Museum, No. 24. Pocatello.

Warren, Claude N., and Anthony J. Ranere

- 1968 Outside Danger Cave: A view of early man in the Great Basin. In Early
Man in North America: Symposium of the Southwestern Anthropological
Association, San Diego, 1968. Cynthia Irwin-Williams, ed. Eastern New
Mexico University Contributions in Anthropology, 1(4):6-18. Portales.

Warren, Claude N., Cort Sims, and Max G. Pavacic

- 1968 Cultural chronology in Hells Canyon. Tebiwa, 12(2):28-34.

Weakly, Harry E.

- 1950 Dendrochronology and its climatic implications in the Central Plains.
In Proceedings of the Sixth Plains Archaeological Conference, 1948.
Jesse D. Jennings, ed. University of Utah Anthropological Papers,
11:90-94. Salt Lake City.

Weaver, John E.

- 1956 Grasslands of the Great Plains: Their Nature and Uses. Lincoln:
Johnson Publishing Co.

- 1968 Prairie Plants and Their Environments: A Fifty-Year Study in the
Midwest. Lincoln: University of Nebraska Press.

Wedel, Waldo R.

- 1941 Environment and Native Subsistence Economies in the Central Great Plains. Smithsonian Miscellaneous Collections, 101(3):1-29.
- 1948 Prehistory and the Missouri Valley Development Program. Smithsonian Miscellaneous Collections, 3(2):1-52.
- 1949 Some provisional correlations in Missouri Basin archaeology. American Antiquity, 14(4):328-339.
- 1953 Human ecology in the Central Plains. American Anthropologist, 55(4):499-514.
- 1954 Earthenware and steatite vessels from northwestern Wyoming. American Antiquity, 19(4):403-408.
- 1961 Prehistoric Man on the Great Plains. Norman: University of Oklahoma Press.
- 1963 The High Plains and their utilization by the Indians. American Antiquity, 29(1):1-16.
- 1964 The Great Plains. In Prehistoric Man in the New World. Jesse D. Jennings and Edward Norbeck, eds. Pp. 193-220. Chicago: University of Chicago Press.

Wedel, Waldo R., et al.

- 1968 Mummy Cave: Prehistoric record from Rocky Mountains of Wyoming. Science, 160:184-185.

Weide, Margaret L., and David L. Weide

- 1969 A cache from Warner Valley, Oregon. Tebiwa, 12(2):28-34.

Wendland, Wayne M.

- 1978 Holocene Man in North America: The ecological setting and climatic background. Plains Anthropologist, 23(82):273-288.

Wentworth, Edward N.

- 1948 America's Sheep Trails. Ames: University of Iowa Press.

Wettlaufer, Boyd

- 1951 An archaeological survey of Saskatchewan, No. 1. Manuscript on file, Laboratory of Archaeology and Ethnology, Saskatchewan Museum of Natural History. Regina.
- 1955 The Mortlach site in the Besant Valley of central Saskatchewan. Saskatchewan Museum of Natural History, Anthropological Series, No. 1. Regina.

Wettlaufer, Boyd, and William J. Mayer-Oakes

- 1960 The Long Creek site. Saskatchewan Museum of Natural History, Anthropological Series, No. 2. Regina.

Wheat, Joe Ben

- 1972 The Olsen-Chubbock site: A Paleo-Indian bison kill. Society for American Archaeology Memoir, No. 26.
- 1974 Olsen-Chubbock and Jurgens sites: Four aspects of Paleo-Indian bison economy. Paper presented at the Thirty-second Plains Conference at Laramie, Wyoming, November, 1974.
- 1975 Chipping floors, technology, and typology of the Jurgens site. Paper presented at the Paleo-Indian Life Ways symposium, Texas Tech Museum, Lubbock, Texas, October, 1975.
- 1978 Olsen-Chubbock and Jurgens sites: Four aspects of Paleo-Indian economy. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.
- 1979 The Jurgens Site. Plains Anthropologist Memoir, No. 15.

Wheat, Margaret M.

- 1967 Survival Arts of the Primitive Paiutes. Reno: University of Nevada Press.

Wheeler, Richard P.

- 1954a Selected projectile point types of the United States: II. Bulletin, Oklahoma Anthropological Society, 2:1-6.
- 1954b Two new projectile point types: Duncan and Hanna points. Plains Anthropologist, 1:7-14.

White, Clayton M., and William H. Behle

- 1960 Birds of Flaming Gorge Reservoir Basin. In Ecological Studies of the Flora and Fauna of Flaming Gorge Reservoir Basin, Utah-Wyoming. Seville Flowers et al. University of Utah Anthropological Papers, No. 48, Upper Colorado Series, 3:185-208.

White, E.T.

- 1952 Observations on the butchering techniques of some aboriginal peoples, No. 1. American Antiquity, 17(4):337-338.
- 1953 Observations on the butchering techniques of some aboriginal peoples, No. 2. American Antiquity, 19(2):160-164.
- 1954 Observations on the butchering techniques of some aboriginal peoples, Nos. 3, 4, 5, and 6. American Antiquity, 19(3):254-264.

Williams, Norman C.

- 1955 Laramide History of the Wasatch-Western Uinta Mountains Area, Utah. Wyoming Geological Association Tenth Annual Field Conference Guidebook, 1955. Casper.

Wilson, Michael

- 1973 A preliminary archaeological resource inventory of the northern Bighorn Mountains of Wyoming. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.
- 1974a Appendix: Description of artifacts from the Killpecker Dune Field, Wyoming. Appended to Dune stratigraphy, archaeology, and the chronology of the Killpecker Dune Field by Thomas S. Ahlbrandt. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- 1974b The Casper local fauna and its fossil bison. The Casper Site: A Hell Gap Bison Kill on the High Plains. George C. Frison, ed. New York: Academic Press.
- 1974c History of the bison in Wyoming with particular reference to early Holocene forms. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.
- 1975 Holocene fossil bison from Wyoming and adjacent areas. Master's thesis, University of Wyoming. Laramie.
- 1978 Archaeological kill site populations and the Holocene evolution of the genus Bison. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Michael Wilson (ed.)

- 1974 Applied Geology and Archaeology: The Holocene History of Wyoming. Geological Survey of Wyoming, Report of Investigations, No. 10.

Wilson, Michael, and Leslie B. Davis

- 1978 Epilogue: Retrospect and prospect in the man-bison paradigm. In Bison Procurement and Utilization: A Symposium. Leslie B. Davis and Michael Wilson, eds. Plains Anthropologist Memoir, No. 14.

Winter, Joseph

- 1973 The distribution and development of Fremont maize agriculture: Some preliminary interpretations. American Antiquity, 38(4):439-452.

Wissler, Clark

- 1914 The influence of the horse in the development of Plains Indian culture. American Anthropologist, 16.

Witkind, Max

- 1971 An archaeological interpretation of the Roberts Buffalo Jump site, Larimer, Colorado. Master's thesis, Colorado State University. Fort Collins.

Wolfbauer, Claudia A.

- 1973 Criteria for recognizing paleoenvironments in an playa-lake complex: The Green River Formation of Wyoming. Wyoming Geological Association Twenty-fifth Annual Field Conference Guidebook. Casper.

WPA Writers Program

- 1952 Wyoming: A Guide to Its History, Highways, and People. New York: Oxford.

Wormington, H. Marie

- 1955 A Reappraisal of the Fremont Culture. Proceedings of the Denver Museum of Natural History, No. 1.
- 1957 Ancient Man in North America. Fifth edition. Denver Museum of Natural History, Popular Series, No. 4.

Wormington, H. Marie, and Robert H. Lister

- 1956 Archaeological Investigations on the Uncompaghre Plateau in West Central Colorado. Proceedings of the Denver Museum of Natural History, No. 2.

Wright, Gary A.

- 1975 A preliminary report on the archaeology of the Jackson Hole country, Wyoming. Manuscript on file, Midwest Archeological Center, National Park Service, Lincoln, NB.
- 1978 The Shoshonean migration problem. Plains Anthropologist, 23(80):113-137.

Wright, Gary A., Susan Bender, and Stuart Reeve

- 1980 High country adaptations. Plains Anthropologist, 25(89):191-197.

Wright, Gary A., and Thomas E. Marceau

- 1977 Archaeological reconnaissance in western Jackson Hole. Manuscript on file, Midwest Archeological Center, National Park Service, Lincoln, NB.

Wright, Gary A., and Stuart Reeve

- 1976 A preliminary report on Two Ocean Lake 1 (48-TE-357): A seasonal camp in Grand Teton National Park. Manuscript on file, Midwest Archeological Center, National Park Service, Lincoln, NB.

Wright, H. E., Jr., and David G. Frey (eds.)

1965 The Quaternary of the United States, Part I: Geology. Princeton: Princeton University Press.

Wright, J. R., and H. G. Pilsner

1968 Juniperus osteosperma in Northwestern Wyoming: Their Distribution and Ecology. University of Wyoming Agricultural Experiment Station Science Monograph, No. 7.

Yanovsky, Elias

1936 Food Plants of the North American Indians. United States Department of Agriculture Miscellaneous Publications, 3: 1-83.

Young, Jack F., and Paul C. Singleton

1977 Wyoming General Soil Map. University of Wyoming Agricultural Experiment Station Research Journal, No. 117.

Ziemens, George M.

1975a 48AB301: A Late Prehistoric Period site in the Shirley Basin of Wyoming. Master's thesis, University of Wyoming. Laramie.

1975b A preliminary report of an archeological survey for the Kerr-McGee Coal Corporation East Gillette Mining Area. Report on file, Office of the Wyoming State Archeologist. Laramie.

1976a Althithermal occupation in the Bighorn Mountains of Wyoming. Paper presented at the Joint Plains-Midwest Anthropological Conference, Minneapolis.

1976b Progress report of archeological investigations at the Grey Rocks Reservoir, Wheatland, Wyoming. Report on file, Office of the Wyoming State Archeologist. Laramie.

Ziemens, George M., and Danny N. Walker

1974 Bell Cave, Wyoming: Preliminary archaeological and paleontological investigations. In Applied Geology and Archaeology: The Holocene History of Wyoming. Michael Wilson, ed. Geological Survey of Wyoming, Report of Investigations, No. 10.

1976 An inventory of archeological resources in the Gas Hill Uranium Mining District. Report on file, Department of Anthropology, University of Wyoming. Laramie.

Ziemens, George M., and Danny N. Walker (eds.)

1977a Archeology of the eastern Powder River Basin, Wyoming. Manuscript prepared for the Bureau of Land Management, on file at the Department of Anthropology, University of Wyoming. Laramie.

1977b A cultural resource inventory of the Muddy Creek Divide and Lost Wells Butte areas near Riverton, Wyoming. Report of studies conducted for the Bureau of Reclamation and the National Park Service by the Office of the State Archeologist. Laramie.

Ziemens, George M., Danny N. Walker, and Thomas K. Larson

1976 Archeological findings and recommendations for a proposed uranium mine in Sweetwater County, Wyoming. Report on file, Department of Anthropology, University of Wyoming. Laramie.

Ziemens, George M., Danny N. Walker, Thomas K. Larson, John P. Albanese, and George W. Gill

1976 The Dunlap-McMurray Burial (48NA67), Natrona County, Wyoming. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.

Ziemens, George M., Danny N. Walker, David J. MacGuire, and John P. Albanese

n.d. Archaeological investigations at the Lumis Ranch site 48LA325. Manuscript on file, Department of Anthropology, University of Wyoming. Laramie.

Ziemens, George M., and Sandy Ziemens

1974 Volumes of bison astragali. The Casper Site: A Hell Gap Bison Kill on the High Plains. George C. Frison, ed. New York: Academic Press.

Zier, Anne H., and T. C. Peebles

1982 Report on the Kemmerer Resources Area Class II cultural resource inventory, Lincoln and Uinta Counties, Wyoming. Report submitted by Metcalf-Zier Archaeologists, Inc., to the Bureau of Land Management (Contract No. YA-533-RFP1-35).

Zier, Christian J.

1977 Archaeology of the Rocky Mountain Energy Rail Spur between Cumberland Gap and the South Haystack Mine, Uinta and Lincoln Counties, Southwestern Wyoming. Technical Report, Western Wyoming College. Rock Springs.

1981 Report of a Class III Archaeological and Historical Survey of the Medicine Bow Mine in Carbon County, Wyoming. Eagle, CO: Metcalf-Zier Archaeologists, Inc.

Zohner, Kelvin Davis

1967 A guide to the biogeographic literature of Utah. Master's thesis, University of Utah. Salt Lake City.

BLANK PAGE

APPENDIX I
Daily Log Summary

DAILY LOG SUMMARY

Discovery Crew

<u>Date</u>	<u>Unit</u>	<u>Personnel</u>	<u># Sweeps*</u>	<u>Comments</u>
7/5	1	5	20	partial lay-out of unit
7/6	23, 26	5	24	hot and buggy; adjacent units
7/7	26	5	16	ran out of pin flags
7/8	21	5	20	time lost in locating next unit
7/9	9	5	20	serious bug problem
7/10	8	5	16.5	ran out of pin flags
7/11	8, 7, 15	5	26.5	adjacent units
7/12	15	5	18	warm to hot weather
7/13	Discoverers needed on mapping/analysis crews			
7/14	"	"	"	"
7/19	--	2	--	sample unit set-up
7/20	3	4	20	one crew member short
7/21	2	5	20	unit not staked as shown on topo
7/22	5	5	20	
7/23	6	5	18	6 hour day/trip to town
7/24	6, 22	5	26	
7/25	28	5	9.5	rain; exceptionally large # artifacts
7/26	28	5	6.5	ran out of orange pin flags; flagged concentrations
7/27	28	5	10	+resurvey of 6 transects at beginning
7/28	Discoverers needed on mapping/analysis crews			
8/2	--	2	--	sample unit set-up
8/3	24, 10	5	22	"salted" unit
8/4	10	5	18	
8/5	17	5	20	very hot; more relief than in any previous unit
8/6	12	5	20	8 hour day
8/7	25	5	20	
8/8	13, 25	5	20	after unit 13, went to 25 and gridded concentrations
8/9	4	5	10.5	ran out of orange pin flags; red-flagged concentrations
8/10	4, 14	5	21.5	adjacent units
8/11	14	5	8	gridded unit 4; short day-end of week
8/16	--	2	--	sample unit set-up, discoverers needed on other crews
8/17	20	5	20	flagged 2 concentrations after survey
8/18	19	5	20	
8/19	16	5	20	poor visibility in big sage
8/20	--			no more units surveyed
8/21	--			
8/22	--			
8/23	--			
8/24	--			
8/25	--			

*20 sweeps completes a sample unit.

DAILY LOG SUMMARY

Mapping Crew

<u>Date</u>	<u>Unit</u>	<u>Personnel</u>	<u># Shots</u>	<u>Comments</u>
7/4	1	1	--	set-up, SLL and LAW, 1/2 day each
7/5	26,23	2	--	set-up
7/6	26,23	2	--	set-up
7/7	25,12	2	--	set-up
7/8	1	2	17	
	23	2	67	
7/9	23	2	105	rainy morning, lightning danger
	26	2	102	
7/10	26	2	215	cold and windy
7/11	26	2	45	
	21	2(1/3)	131	Anne scribed on 31 shots, greatly speeded up process.
7/12	8	2	216	
7/13	8	2(1/3)	244	Ethan scribed on ±205 shots, not very with it.
7/14	7	2	47	
	8	2	26	
7/19	15	2	223	
7/20	15	2	183	rainy, lightning danger in morning
	8	2	27	
7/21	8	2+	269	Anne scribed on ±25 shots.
7/22	2	2	90	cold drizzle throughout day
7/23	3	2+	179	Sylvia scribed on 12 shots.
7/24	3	2+	209	Sylvia scribed on 209 shots; radio antenna broke.
	5	2	22	
7/26	22	2+	201	Anne and Jim scribed on 66 shots.
7/27	22	2	94	wild horses; Jim scribed on 6.
	6	3	201	
7/28	6	2	78	
	28	3	31	Jim scribed; short day.
8/1	9	2	34	2 hours worked
8/2	28	3	315	scribe
8/3	28	3	369	scribe
8/4	28	3	418	Judge visit; scribe
8/5	24	2	30	
	10	2	116	
8/6	10	3	282	scribe
8/7	10	2	168	1/2 day analyzed for ± 2 hours
8/8	17	2	68	analysis 1/2 day
8/9	17	2+	274	121 shots with scribe
8/10	13	2	11	plus analysis of all shots
	25	2	115	Flying ants swarmed instrument and station.
8/11	25	2	119	

Mapping Crew Daily Log, contd.

<u>Date</u>	<u>Unit</u>	<u>Personnel</u>	<u># Shots</u>	<u>Comments</u>
8/16	12	2	110	Topography required 4 stations.
8/17	9	2	99	Flags unnumbered; had to recode unit.
8/18	14	2	16	plus analysis of all shots
	4	2	28	rain and lightning in afternoon
8/19	4	2	123	spent 2½ hours unstucking truck;
				rain and lightning in afternoon
				shortened day.
8/20	16	3	158	scribe; much walking
8/21	12	2	13	
	19	2+	201	120 shots scribed
8/22	19	3	163	scribe; 3 stations
8/23	20	2+	261	206 shots scribed
8/24	4	3	244	2 stations, scribe
8/25	4	3	22	1 hour mapping, then camp clean-up

DAILY LOG SUMMARY

Recording Crew

Date	Unit	Personnel	# Items/Features/Grids Coded				Comments
			H	P	F	G*	
7/5	--	2					camp set up, errands
7/6	9,21	2					2 units laid out
7/7	13	2					truck stuck in p.m.
7/8	1,23	2	198	9	8	0	hard rain in p.m.
7/9	26	2	210	70	3	0	time lost recording recent trash and bone; short day.
7/10	26	2	24	110	0	0	form revised
7/11	26,21	2	2	134	1	0	helped map crew with unit 26 tie-in shots
7/12	8	2	24	377	0	0	
7/13	15,7,8,9	6.5	148	224	3	0	gridded concentrations in 8; trained Colin, Sylvia, Tom, Bill
7/14	15,8	7	10	232	0	0	made ropes; flagged, gridded, trained.
7/19	15,8	5	3	812	1	3	trained Tom.
7/20	8	4	0	756	1	4	
7/21	8	3	4	797	0	4	
7/22	2	3	0	448	0	2	rain nearly all day
7/23	3	3	13	392	0	0	
7/24	6,5	2.5	2	182	0	0	
7/25	6,22	4	1	324	0	3	trained Doug; rain in p.m.
7/26	22	3	0	266	1	3	
7/27	28	3+	1	595	0	0	Discovery crew gridded and scribed in p.m.
7/28	28	8	2	240	1	0	short day
8/2	28	5	2	599	8	9	
8/3	28	3	0	421	0	9	
8/4	10,24	2	136	258	3	0	
8/5	10	3	0	179	1	0	no previous red-flagging or gridding done
8/6	10	3	2	149	0	0	
8/7	10	3	0	282	0	0	trained B. Cox
8/8	10,17	4	0	460	4	5	LAW and DM helped with grids 1/2 day; long drive to unit 17.
8/9	17	3	4	174	2	0	
8/10	13,25	3	1	175	10	0	Unit 13 done by map crew
8/11	25	2	0	517	5	0	help from map crew in p.m.
8/16	25	3	0	807	0	3	
8/17	--	Recorders needed on Discovery Crew					

Recording Crew Daily Log, contd.

<u>Date</u>	<u>Unit</u>	<u>Personnel</u>	<u># Items/Features/Grids Coded</u>				<u>Comments</u>
			<u>H</u>	<u>P</u>	<u>F</u>	<u>G*</u>	
8/18	--	Recorders needed on Discovery Crew					
8/19	--	"	"	"	"	"	
8/20	25,12	4	0	322	2	0	trained Karen, short day
8/21	12,16,19	4.5	5	420	15	0	
8/22	19	4	0	1406	1	7	
8/23	20	4	0	655	2	2	
8/24	4	4	1	929	2	0	poor access to unit
8/25	4	4	0	933	0	5	

*H - historic items
P - prehistoric items
F - features
G - grids completed

Counts represent number of line entries, not actual number of items coded.

APPENDIX II
Discovery Information

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 1

DISCOVERY INFORMATION

DATE: 05JUL83

DIRECTION WALKED:

SWEEP POSITIONS:

A: TOM PEEBLES
 B: ETHAN GELL
 C: SYLVIA MILLER
 D: ANNE HUMMER
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	0	1	0	1	3	5	10:22:00	10:33:00	0:11:00	0.455
2	0	0	0	0	0	0	10:41:00	10:56:00	0:15:00	0.000
3	0	0	0	0	0	0	10:58:00	11:07:00	0:09:00	0.000
4	1	2	1	1	0	5	11:09:00	11:25:00	0:16:00	0.313
5	0	0	0	0	0	0	11:27:00	11:40:00	0:13:00	0.000
6	0	1	0	0	0	1	11:43:00	11:54:00	0:11:00	0.091
7	0	1	0	0	3	4	11:56:00	12:07:00	0:11:00	0.364
8	2	2	0	0	0	4	13:12:00	13:24:00	0:12:00	0.333
9	0	1	0	0	0	1	13:27:00	13:41:00	0:14:00	0.071
10	4	0	0	0	1	5	13:45:00	14:13:00	0:28:00	0.179
11	0	1	1	0	0	2	14:20:00	14:36:00	0:16:00	0.125
12	0	3	3	0	1	7	14:39:00	15:00:00	0:21:00	0.333
13	0	0	0	0	2	2	15:02:00	15:16:00	0:14:00	0.143
14	3	0	0	0	0	3	15:21:00	15:33:00	0:12:00	0.250
15	1	3	0	0	0	4	15:35:00	15:49:00	0:14:00	0.286
16	0	0	0	3	2	5	15:45:00	16:07:00	0:22:00	0.227
17	0	1	0	3	1	5	16:09:00	16:17:00	0:08:00	0.625
TOTAL	11	16	5	8	13	53			4:07:00	0.223

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 2

DISCOVERY INFORMATION

DATE: 21JUL83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	0	1	1	0	2	4	10:23:00	10:34:00	0:11:00	0.364
2	0	0	0	1	16	17	10:37:00	10:53:00	0:16:00	1.063
3	0	2	0	1	0	3	10:55:00	11:06:00	0:11:00	0.273
4	10	35	36	31	19	131	11:10:00	11:37:00	0:27:00	4.852
5	0	0	1	3	0	4	11:35:00	11:47:00	0:12:00	0.333
6	1	0	0	0	0	1	11:49:00	11:59:00	0:10:00	0.100
7	0	0	1	0	0	1	13:02:00	13:14:00	0:12:00	0.083
8	0	1	0	0	0	1	13:17:00	13:28:00	0:11:00	0.091
9	0	1	0	0	0	1	13:30:00	13:40:00	0:10:00	0.100
10	0	2	0	0	1	3	13:44:00	13:54:00	0:10:00	0.300
11	0	4	0	2	0	6	13:51:00	14:07:00	0:16:00	0.375
12	0	0	0	0	0	0	14:10:00	14:21:00	0:11:00	0.000
13	0	0	0	1	2	3	14:24:00	14:34:00	0:10:00	0.300
14	0	0	0	0	0	0	14:37:00	14:47:00	0:10:00	0.000
15	0	0	1	0	0	1	14:50:00	15:19:00	0:29:00	0.034
16	0	1	1	0	0	2	15:24:00	15:36:00	0:12:00	0.167
17	0	0	0	0	0	0	15:39:00	15:49:00	0:10:00	0.000
18	0	0	0	1	0	1	15:51:00	16:03:00	0:12:00	0.083
19	0	0	0	1	1	2	16:05:00	16:15:00	0:10:00	0.200
20	0	0	0	0	0	0	16:17:00	16:29:00	0:12:00	0.000
TOTAL	11	47	41	41	41	181			4:22:00	0.436

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 3

DISCOVERY INFORMATION

DATE: 20JUL83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: KAREN KRAMER
 C: ETHAN GELL
 D: BILL MCMILLAN
 E:

SWEEP	A	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E						
1	3	7	2	7	0	19	9:16:00	9:34:00	0:18:00	1.056	
2	7	8	3	7	0	25	9:37:00	10:01:00	0:24:00	1.042	
3	7	8	3	7	0	25	10:05:00	10:23:00	0:18:00	1.389	
4	5	15	14	5	0	39	10:27:00	10:49:00	0:22:00	1.773	
5	6	9	3	3	0	21	10:55:00	11:10:00	0:15:00	1.400	
6	0	6	2	4	0	12	11:29:00				
7	3	1	1	0	0	5	12:25:00	12:39:00	0:14:00	0.357	
8	3	7	2	0	0	12	12:41:00	12:59:00	0:18:00	0.667	
9	0	1	1	1	0	3	13:01:00	13:12:00	0:11:00	0.273	
10	0	7	2	0	0	9	13:15:00	13:30:00	0:15:00	0.600	
11	8	1	1	0	0	10	13:34:00	13:45:00	0:11:00	0.909	
12	2	0	0	0	0	2	13:48:00	13:58:00	0:10:00	0.200	
13	1	0	1	3	0	5	14:04:00	14:13:00	0:09:00	0.556	
14	8	0	13	15	0	36	14:26:00	14:51:00	0:25:00	1.440	
15	1	0	0	0	0	1	14:54:00	15:06:00	0:12:00	0.083	
16	0	0	0	2	0	2	15:10:00	15:21:00	0:11:00	0.182	
17	0	1	10	1	0	12	15:25:00	15:38:00	0:13:00	0.923	
18	1	0	0	0	0	1	15:42:00	15:54:00	0:12:00	0.083	
19	5	6	3	6	0	20	15:58:00	16:15:00	0:17:00	1.176	
20	2	4	13	7	0	26	16:19:00	16:36:00	0:17:00	1.529	
TOTAL	62	81	74	68	0	285			4:52:00	0.782	

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 4

DISCOVERY INFORMATION

DATE: 09AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: COLIN GARVEY
 B: TOM PEEBLES
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	1	0	1	1	3	6	8:23:00	8:34:00	0:11:00	0.545
2	1	0	0	0	1	2	8:37:00	8:46:00	0:09:00	0.222
3	1	0	0	0	0	1	9:37:00	9:47:00	0:10:00	0.100
4	1	0	3	1	5	10	9:50:00	10:01:00	0:11:00	0.909
5	1	4	2	17	11	35	10:02:00	10:20:00	0:17:00	2.059
6	49	36	25	46	20	176	10:24:00	10:58:00	0:34:00	5.176
7	19	15	4	8	0	46	11:02:00	11:17:00	0:17:00	2.706
8	13	47	52	20	44	176	11:20:00	11:42:00	0:22:00	8.000
9	1	0	0	0	1	2	13:00:00	13:12:00	0:12:00	0.167
10	0	0	0	0	0	0	13:14:00	13:26:00	0:12:00	0.000
11	16	22	15	20	19	92	13:28:00	13:41:00	0:13:00	7.077
11	0	0	3	0	1	4	8:36:00	8:45:00	0:09:00	0.444
12	2	0	0	1	7	10	8:47:00	9:01:00	0:14:00	0.714
13	0	1	1	10	13	25	9:02:00	9:19:00	0:17:00	1.471
14	25	36	26	46	39	172	9:21:00	9:45:00	0:24:00	7.167
15	12	14	14	5	3	48	9:51:00	10:14:00	0:23:00	2.087
16	0	0	0	1	0	1	10:17:00	10:27:00	0:10:00	0.100
17	0	0	0	0	0	0	10:29:00	10:37:00	0:08:00	0.000
18	1	0	0	0	0	1	10:40:00	10:50:00	0:10:00	0.100
19	0	0	0	0	0	0	10:51:00	10:58:00	0:07:00	0.000
20	0	0	0	0	0	0	11:00:00	11:08:00	0:08:00	0.000
TOTAL	143	175	146	176	167	807			4:58:00	1.952

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 5

DISCOVERY INFORMATION

DATE: 22JUL83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	0	1	0	1	2	8:50:00	9:01:00	0:11:00	0.182
2	0	0	0	0	0	0	9:05:00	9:15:00	0:10:00	0.000
3	0	0	0	0	0	0	9:17:00	9:26:00	0:09:00	0.000
4	0	0	0	0	0	0	9:28:00	9:38:00	0:10:00	0.000
5	0	0	0	0	0	0	9:43:00	9:51:00	0:08:00	0.000
6	0	0	0	0	0	0	9:53:00	10:02:00	0:09:00	0.000
7	0	0	0	0	0	0	10:05:00	10:14:00	0:09:00	0.000
8	0	0	0	0	0	0	10:17:00	10:26:00	0:09:00	0.000
9	0	5	0	0	0	5	10:28:00	10:40:00	0:12:00	0.417
10	0	0	0	0	0	0	10:40:00	10:53:00	0:13:00	0.000
11	0	0	0	0	0	0	11:05:00	11:22:00	0:17:00	0.000
12	0	0	0	0	0	0	11:25:00	11:37:00	0:12:00	0.000
13	0	0	0	0	0	0	12:40:00	12:51:00	0:11:00	0.000
14	0	0	0	0	0	0	12:54:00	13:02:00	0:08:00	0.000
15	0	0	0	1	0	1	13:06:00	13:17:00	0:11:00	0.091
16	0	0	0	0	0	0	13:20:00	13:28:00	0:08:00	0.000
17	0	0	0	0	0	0	13:30:00	13:38:00	0:08:00	0.000
18	0	0	0	0	1	1	13:40:00	13:48:00	0:08:00	0.125
19	0	0	0	0	0	0	13:51:00	14:02:00	0:11:00	0.000
20	4	5	1	0	2	12	14:04:00	14:20:00	0:16:00	0.750
TOTAL	4	10	2	1	4	21			3:30:00	0.078

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 6

DISCOVERY INFORMATION

DATE: 23JUL83

DIRECTION WALKED:

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	3	33	0	0	36	9:20:00	9:35:00	0:15:00	2.400
2	0	1	0	2	0	3	9:40:00	9:50:00	0:10:00	0.300
3	0	0	0	3	3	6	9:54:00	10:03:00	0:09:00	0.667
4	4	3	3	20	5	35	10:06:00	10:20:00	0:14:00	2.500
5	0	4	6	3	6	19	10:21:00	10:34:00	0:13:00	1.462
6	0	2	3	1	0	6	10:37:00	10:48:00	0:11:00	0.545
7	0	0	0	6	8	14	10:50:00	11:03:00	0:13:00	1.077
8	1	3	2	3	0	9	11:07:00	11:17:00	0:10:00	0.900
9	3	3	0	0	3	9	11:20:00	11:33:00	0:13:00	0.692
10	0	0	0	3	6	9	11:37:00	11:47:00	0:10:00	0.900
11	1	0	2	2	1	6	12:34:00	12:47:00	0:13:00	0.462
12	3	8	11	6	3	31	12:49:00	13:03:00	0:14:00	2.214
13	7	9	17	3	5	41	13:05:00	13:21:00	0:16:00	2.563
14	2	2	0	1	0	5	13:24:00	13:34:00	0:10:00	0.500
15	0	3	0	0	3	6	13:38:00	13:47:00	0:09:00	0.667
16	4	1	1	1	2	9	13:50:00	14:03:00	0:13:00	0.692
17	0	1	0	0	2	3	14:05:00	14:15:00	0:10:00	0.300
18	1	0	0	0	0	1	14:18:00	14:29:00	0:11:00	0.091
19	2	0	0	0	1	3	9:01:00	9:13:00	0:12:00	0.250
20	0	0	0	0	0	0	9:15:00	9:27:00	0:12:00	0.000
TOTAL	28	43	78	54	48	251			3:58:00	0.959

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 7

DISCOVERY INFORMATION

DATE: 11JUL83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	0	0	0	0	0	10:59:00	11:07:00	0:08:00	0.000
2	1	0	0	0	0	1	11:04:00	11:17:00	0:13:00	0.077
3	0	0	0	0	0	0	11:19:00	11:26:00	0:07:00	0.000
4	1	0	0	0	0	1	11:28:00	11:35:00	0:07:00	0.143
5	1	0	0	0	0	1	12:24:00	12:37:00	0:13:00	0.077
6	1	0	0	0	3	4	12:39:00	12:47:00	0:08:00	0.500
7	0	1	9	15	35	60	12:50:00	13:00:00	0:10:00	6.000
8	3	3	7	5	4	22	13:05:00	13:16:00	0:11:00	2.000
9	4	8	6	6	6	30	13:18:00	13:33:00	0:15:00	2.000
10	2	1	2	1	2	8	13:35:00	13:46:00	0:11:00	0.727
11	3	2	0	0	1	6	13:48:00	13:58:00	0:10:00	0.600
12	0	0	0	0	0	0	14:01:00	14:09:00	0:08:00	0.000
13	0	0	1	0	2	3	14:11:00	14:22:00	0:11:00	0.273
14	0	4	0	1	0	5	14:25:00	14:35:00	0:10:00	0.500
15	4	2	1	2	5	14	14:38:00	14:48:00	0:10:00	1.400
16	0	0	0	0	0	0	14:51:00	14:59:00	0:08:00	0.000
17	0	0	0	0	0	0	15:02:00	15:10:00	0:08:00	0.000
18	0	0	3	1	8	12	15:12:00	15:22:00	0:10:00	1.200
19	0	0	0	0	1	1	15:25:00	15:32:00	0:07:00	0.143
20	0	0	0	0	0	0	15:34:00	15:45:00	0:11:00	0.000
TOTAL	20	21	29	31	67	168			3:16:00	0.782

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

DISCOVERY INFORMATION

DATE: 10JUL83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	1	0	0	1	2	8:47:00	8:57:00	0:10:00	0.200
2	0	1	0	2	0	3	9:01:00	9:13:00	0:12:00	0.250
3	0	0	1	0	0	1	9:15:00	9:25:00	0:10:00	0.100
4	9	8	12	7	9	45	9:30:00	9:50:00	0:20:00	2.250
5	11	17	10	5	6	49	9:53:00	10:17:00	0:24:00	2.042
6	1	1	3	16	0	21	10:21:00	10:41:00	0:20:00	1.050
7	2	0	0	1	8	11	10:45:00	10:55:00	0:10:00	1.100
8	8	3	6	5	5	27	10:58:00	11:17:00	0:19:00	1.421
9	7	1	1	3	4	16	11:19:00	11:35:00	0:16:00	1.000
10	6	2	3	6	0	17	11:39:00	11:57:00	0:18:00	0.944
11	4	14	16	10	74	118	12:59:00	13:35:00	0:36:00	3.278
12	7	32	37	34	28	138	13:38:00	14:11:00	0:33:00	4.182
13	40	72	84	50	27	273	14:17:00	14:45:00	0:28:00	9.750
14	0	0	0	0	0	0	15:05:00	15:33:00	0:28:00	0.000
15	12	5	13	4	5	39	15:35:00	15:53:00	0:18:00	2.167
16	7	6	4	3	3	23	15:57:00	16:17:00	0:20:00	1.150
17	610	25	31	9	18	693	16:20:00	16:25:00	0:05:00	138.6
17	6	4	3	1	1	15	9:00:00	9:09:00	0:09:00	1.667
18	31	37	22	16	13	119	9:13:00	9:45:00	0:32:00	3.719
19	3	5	6	0	1	15	9:48:00	10:05:00	0:17:00	0.882
20	1	2	17	3	4	27	10:07:00	10:32:00	0:25:00	1.080
TOTAL	765	236	269	175	207	1652			6:50:00	8.842

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 9

DISCOVERY INFORMATION

DATE: 09JUL83

DIRECTION WALKED:

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	0	0	0	0	0	8:38:00	8:48:00	0:10:00	0.000
2	2	1	0	0	0	3	8:52:00	9:00:00	0:08:00	0.375
3	4	0	0	4	1	9	9:03:00	9:11:00	0:08:00	1.125
4	1	1	2	1	3	8	9:15:00	9:24:00	0:09:00	0.889
5	1	1	1	2	1	6	9:27:00	9:33:00	0:06:00	1.000
6	1	2	2	4	4	13	9:36:00	9:45:00	0:09:00	1.444
7	0	3	0	7	2	12	9:47:00	9:55:00	0:08:00	1.500
8	0	1	0	1	0	2	9:51:00	10:06:00	0:15:00	0.133
9	0	0	0	0	0	0	10:10:00	10:18:00	0:08:00	0.000
10	0	0	1	1	0	2	10:21:00	10:29:00	0:08:00	0.250
11	0	1	0	2	1	4	10:34:00	10:49:00	0:15:00	0.267
12	0	1	1	3	0	5	10:51:00	10:58:00	0:07:00	0.714
13	1	2	1	0	3	7	11:40:00	11:48:00	0:08:00	0.875
14	0	0	2	1	2	5	11:51:00	11:58:00	0:07:00	0.714
15	0	0	0	1	2	3	12:01:00	12:09:00	0:08:00	0.375
16	3	0	0	0	1	4	12:11:00	12:21:00	0:10:00	0.400
17	0	3	0	0	0	3	12:23:00	12:31:00	0:08:00	0.375
18	1	1	1	1	3	7	12:35:00	12:43:00	0:08:00	0.875
19	0	0	2	4	4	10	12:45:00	12:54:00	0:09:00	1.111
20	1	0	3	2	2	8	12:56:00	13:04:00	0:08:00	1.000
TOTAL	15	17	16	34	29	111			2:57:00	0.671

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 10

DISCOVERY INFORMATION

DATE: 03AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFICIENCY
	A	B	C	D	E					
1	0	1	1	0	0	2	16:07:00	16:19:00	0:12:00	0.167
2	2	1	0	2	0	5	16:24:00	16:37:00	0:13:00	0.385
3	6	13	34	11	12	76	8:41:00	9:11:00	0:30:00	2.533
4	0	0	1	0	1	2	9:15:00	9:27:00	0:12:00	0.167
5	0	0	1	1	0	2	9:29:00	9:41:00	0:12:00	0.167
6	3	1	1	0	0	5	9:44:00	10:02:00	0:18:00	0.278
7	3	9	1	11	8	32	10:04:00	10:26:00	0:22:00	1.455
8	1	5	0	3	10	19	10:30:00	10:50:00	0:20:00	0.950
9	1	0	0	0	2	3	10:58:00	11:09:00	0:11:00	0.273
10	12	12	4	10	11	49	11:12:00	11:31:00	0:19:00	2.579
11	0	0	0	1	0	1	12:29:00	12:46:00	0:17:00	0.059
12	1	6	72	32	0	111	12:45:00	13:07:00	0:22:00	5.045
13	0	0	0	0	0	0	13:20:00	13:34:00	0:14:00	0.000
14	0	0	0	0	0	0	13:37:00	13:47:00	0:10:00	0.000
15	0	0	1	0	0	1	13:50:00	14:01:00	0:11:00	0.091
16	0	1	0	0	0	1	14:03:00	14:15:00	0:12:00	0.083
17	0	0	0	0	9	9	14:17:00	14:34:00	0:17:00	0.529
18	0	3	6	5	23	37	14:47:00	15:08:00	0:21:00	1.762
19	0	0	3	0	16	19	15:11:00	15:30:00	0:19:00	1.000
20	18	32	29	36	27	142	15:32:00	15:59:00	0:27:00	5.259
TOTAL	47	84	154	112	119	516			5:39:00	1.139

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 13

DISCOVERY INFORMATION

DATE: 08AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	0	0	0	0	0	0	8:39:00	8:49:00	0:10:00	0.000
2	0	0	0	0	0	0	8:51:00	8:59:00	0:08:00	0.000
3	0	2	0	0	0	2	9:01:00	9:12:00	0:11:00	0.182
4	0	0	0	0	0	0	9:14:00	9:24:00	0:10:00	0.000
5	0	0	0	0	0	0	9:26:00	9:33:00	0:07:00	0.000
6	0	0	0	1	0	1	9:35:00	9:45:00	0:10:00	0.100
7	0	0	0	0	0	0	9:47:00	9:56:00	0:09:00	0.000
8	0	0	0	0	0	0	9:58:00	10:07:00	0:09:00	0.000
9	0	1	0	0	0	1	10:20:00	10:31:00	0:11:00	0.091
10	0	0	0	0	0	0	10:33:00	10:41:00	0:08:00	0.000
11	0	0	0	0	0	0	10:44:00	10:53:00	0:09:00	0.000
12	0	0	0	0	0	0	10:56:00	11:05:00	0:09:00	0.000
13	0	0	0	0	0	0	11:07:00	11:16:00	0:09:00	0.000
14	0	1	0	0	0	1	11:18:00	11:27:00	0:09:00	0.111
15	0	0	0	0	0	0	13:07:00	13:16:00	0:09:00	0.000
16	0	0	0	0	0	0	13:18:00	13:26:00	0:08:00	0.000
17	0	0	0	0	0	0	13:28:00	13:36:00	0:08:00	0.000
18	0	0	1	0	0	1	13:38:00	13:47:00	0:09:00	0.111
19	0	0	0	0	0	0	13:49:00	13:56:00	0:07:00	0.000
20	0	0	0	1	0	1	13:58:00	14:07:00	0:09:00	0.111
TOTAL	0	4	1	2	0	7			2:59:00	0.035

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 14

DISCOVERY INFORMATION

DATE: 10AUG83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: COLIN GARVEY
 B: TOM PEEBLES
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	0	0	0	0	1	1	12:47:00	12:55:00	0:08:00	0.125
2	0	0	0	0	0	0	12:57:00	13:05:00	0:08:00	0.000
3	0	0	0	0	0	0	13:07:00	13:14:00	0:07:00	0.000
4	0	0	0	0	0	0	13:17:00	13:22:00	0:05:00	0.000
5	0	0	0	0	0	0	13:25:00	13:32:00	0:07:00	0.000
6	0	0	0	0	0	0	13:34:00	13:42:00	0:08:00	0.000
7	0	0	0	0	0	0	13:45:00	13:52:00	0:07:00	0.000
8	0	0	0	0	0	0	13:56:00	14:03:00	0:07:00	0.000
9	0	0	0	0	0	0	14:18:00	14:26:00	0:08:00	0.000
10	0	0	0	0	0	0	14:28:00	14:36:00	0:08:00	0.000
11	0	0	0	1	0	1	14:38:00	14:45:00	0:07:00	0.143
12	0	0	0	0	0	0	14:48:00	14:54:00	0:06:00	0.000
13	0	0	0	0	0	0	8:05:00	8:13:00	0:08:00	0.000
14	1	2	1	0	0	4	8:15:00	8:27:00	0:12:00	0.333
15	0	0	0	0	0	0	8:28:00	8:37:00	0:09:00	0.000
16	0	0	0	0	0	0	8:43:00	8:52:00	0:09:00	0.000
17	1	0	0	0	0	1	8:56:00	9:05:00	0:09:00	0.111
18	0	0	0	0	0	0	9:10:00	9:18:00	0:08:00	0.000
19	0	0	0	0	0	0	9:23:00	9:31:00	0:08:00	0.000
20	0	0	0	0	0	0	9:35:00	9:42:00	0:07:00	0.000
TOTAL	2	2	1	1	1	7			2:36:00	0.036

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 15

DISCOVERY INFORMATION

DATE: 11JUL83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	1	0	0	0	1	16:19:00	16:33:00	0:14:00	0.071
2	1	1	0	0	1	3	16:36:00	16:53:00	0:17:00	0.176
3	0	1	0	0	33	34	8:48:00	9:12:00	0:24:00	1.417
4	16	6	12	1	5	40	9:16:00	9:38:00	0:22:00	1.818
5	9	10	3	6	6	34	9:41:00	10:05:00	0:24:00	1.417
6	1	1	2	4	5	13	10:08:00	10:23:00	0:15:00	0.867
7	2	1	3	0	2	8	10:29:00	10:44:00	0:15:00	0.533
8	0	0	3	0	0	3	10:47:00	11:02:00	0:15:00	0.200
9	1	17	3	18	0	39	11:05:00	11:21:00	0:16:00	2.438
10	3	1	9	1	1	15	11:24:00	11:40:00	0:16:00	0.938
11	3	1	2	5	3	14	12:45:00	12:57:00	0:12:00	1.167
12	1	0	2	2	2	7	13:00:00	13:14:00	0:14:00	0.500
13	1	3	2	3	0	9	13:17:00	13:28:00	0:11:00	0.818
14	1	0	0	0	0	1	13:31:00	13:40:00	0:09:00	0.111
15	0	0	0	0	0	0	13:44:00	13:52:00	0:08:00	0.000
16	2	0	0	1	1	4	14:03:00	14:17:00	0:14:00	0.286
17	0	0	1	0	0	1	14:20:00	14:29:00	0:09:00	0.111
18	2	0	2	1	0	5	14:33:00	14:44:00	0:11:00	0.455
19	0	0	1	0	0	1	14:47:00	14:55:00	0:08:00	0.125
20	1	0	0	1	1	3	14:58:00	15:14:00	0:16:00	0.188
TOTAL	44	43	45	43	60	235			4:50:00	0.682

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 16

DISCOVERY INFORMATION

DATE: 19AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: COLIN GARVEY
 B: KAREN KRAMER
 C: SYLVIA MILLER
 D: SIGNA LARRALDE
 E: ETHAN GELL

SWEEP	A	ARTIFACT COUNTS				TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E					
1	0	0	0	0	0	0	8:54:00	9:05:00	0:11:00	0.000
2	0	0	0	0	0	0	9:10:00	9:18:00	0:08:00	0.000
3	0	0	0	0	0	0	9:22:00	9:34:00	0:12:00	0.000
4	0	0	0	0	0	0	9:37:00	9:45:00	0:08:00	0.000
5	0	0	0	0	0	0	9:47:00	9:54:00	0:07:00	0.000
6	0	0	0	0	0	0	10:00:00	10:10:00	0:10:00	0.000
7	0	0	1	0	0	1	10:14:00	10:22:00	0:08:00	0.125
8	15	8	7	5	4	39	10:25:00	10:38:00	0:13:00	3.000
9	2	0	1	0	0	3	10:41:00	10:53:00	0:12:00	0.250
10	6	3	3	6	0	18	11:00:00	11:15:00	0:15:00	1.200
11	2	2	0	3	1	8	11:17:00	11:28:00	0:11:00	0.727
12	2	1	3	0	2	8	11:31:00	11:43:00	0:12:00	0.667
13	0	1	0	0	0	1	11:47:00	12:04:00	0:17:00	0.059
14	0	0	0	0	0	0	13:05:00	13:14:00	0:09:00	0.000
15	0	0	0	0	0	0	13:16:00	13:24:00	0:08:00	0.000
16	0	0	0	0	0	0	13:27:00	13:36:00	0:09:00	0.000
17	0	0	4	11	5	20	13:43:00	13:58:00	0:15:00	1.333
18	6	5	10	11	2	34	14:02:00	14:16:00	0:14:00	2.429
19	2	1	0	0	2	5	14:19:00	14:31:00	0:12:00	0.417
20	0	0	0	0	0	0	14:33:00	14:42:00	0:09:00	0.000
TOTAL	35	21	29	36	16	137			3:40:00	0.510

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 17

DISCOVERY INFORMATION

DATE: 05AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	4	4	2	1	2	13	8:43:00	9:02:00	0:19:00	0.684
2	0	0	1	3	2	6	9:05:00	9:18:00	0:13:00	0.462
3	1	2	1	0	0	4	9:20:00	9:31:00	0:11:00	0.364
4	0	1	0	1	0	2	9:34:00	9:50:00	0:16:00	0.125
5	0	0	6	6	5	17	9:53:00	10:08:00	0:15:00	1.133
6	7	4	6	4	0	21	10:11:00	10:29:00	0:18:00	1.167
7	8	4	4	0	0	16	10:32:00	10:49:00	0:17:00	0.941
8	2	0	0	0	3	5	10:51:00	11:05:00	0:14:00	0.357
9	3	0	0	0	0	3	11:07:00	11:19:00	0:12:00	0.250
10	0	1	0	0	0	1	11:21:00	11:33:00	0:12:00	0.083
11	0	1	0	0	4	5	12:46:00	12:57:00	0:11:00	0.455
12	0	0	0	0	2	2	13:00:00	13:12:00	0:12:00	0.167
13	33	35	6	3	6	83	13:15:00	13:36:00	0:21:00	3.952
14	3	0	1	0	18	22	13:39:00	13:59:00	0:20:00	1.100
15	1	0	0	0	0	1	14:03:00	14:13:00	0:10:00	0.100
16	0	0	0	1	0	1	14:15:00	14:27:00	0:12:00	0.083
17	2	3	0	0	1	6	14:29:00	14:41:00	0:12:00	0.500
18	0	0	0	0	0	0	14:44:00	14:55:00	0:11:00	0.000
19	1	0	0	0	0	1	14:58:00	15:08:00	0:10:00	0.100
20	0	0	0	0	0	0	15:10:00	15:23:00	0:13:00	0.000
TOTAL	65	55	27	19	43	209			4:39:00	0.601

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

DISCOVERY INFORMATION

DATE: 08AUG83

DIRECTION WALKED:

SWEEP POSITIONS:

A: COLIN GARVEY
 B: KAREN KRAMER
 C: SYLVIA MILLER
 D: SIGNA LARRALDE
 E: ETHAN GELL

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	3	10	17	6	1	37	8:24:00	8:45:00	0:21:00	1.762
2	16	33	10	16	1	76	8:49:00	9:16:00	0:27:00	2.815
3	0	2	8	6	4	20	9:20:00	9:33:00	0:13:00	1.538
4	1	2	2	1	3	9	9:36:00	9:47:00	0:11:00	0.818
5	6	2	1	3	1	13	9:49:00	10:01:00	0:12:00	1.083
6	2	2	0	0	1	5	10:05:00	10:15:00	0:10:00	0.500
7	0	0	0	0	0	0	10:17:00	10:26:00	0:09:00	0.000
8	0	0	0	0	0	0	10:30:00	10:37:00	0:07:00	0.000
9	0	0	0	0	0	0	10:38:00	10:48:00	0:10:00	0.000
10	0	1	0	0	0	1	10:53:00	11:02:00	0:09:00	0.111
11	0	0	0	8	6	14	11:05:00	11:18:00	0:13:00	1.077
12	0	38	3	2	1	44	11:21:00	11:48:00	0:27:00	1.630
13	2	5	2	1	5	15	13:09:00	13:20:00	0:11:00	1.364
14	1	5	1	1	1	9	13:24:00	13:36:00	0:12:00	0.750
15	3	0	7	4	5	19	13:39:00	13:52:00	0:13:00	1.462
16	7	9	8	12	1	37	13:55:00	14:10:00	0:15:00	2.467
17	6	25	9	14	10	64	14:17:00	14:33:00	0:16:00	4.000
18	4	12	30	3	3	52	14:34:00	14:50:00	0:16:00	3.250
19	0	3	2	2	1	8	14:55:00	15:06:00	0:11:00	0.727
20	5	7	3	7	3	25	15:09:00	15:21:00	0:12:00	2.083
TOTAL	56	156	103	86	47	448			4:35:00	1.372

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 20

DISCOVERY INFORMATION

DATE: 17AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: COLIN GARVEY
 B: KAREN KRAMER
 C: SYLVIA MILLER
 D: SIGNA LARRALDE
 E: ETHAN GELL

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	0	0	1	0	1	8:54:00	9:04:00	0:10:00	0.100
2	0	0	0	0	0	0	9:06:00	9:13:00	0:07:00	0.000
3	1	0	0	0	0	1	9:15:00	9:26:00	0:11:00	0.091
4	0	0	0	0	0	0	9:29:00	9:37:00	0:08:00	0.000
5	0	0	0	0	0	0	9:39:00	9:47:00	0:08:00	0.000
6	0	0	0	0	0	0	9:50:00	9:59:00	0:09:00	0.000
7	0	2	3	2	0	7	10:11:00	10:27:00	0:16:00	0.438
8	6	5	2	12	13	38	10:30:00	10:44:00	0:14:00	2.714
9	2	5	12	15	14	48	10:49:00	11:04:00	0:15:00	3.200
10	0	1	0	0	1	2	11:08:00	11:19:00	0:11:00	0.182
11	0	0	6	3	0	9	11:21:00	11:32:00	0:11:00	0.818
12	0	0	0	0	0	0	11:35:00	11:42:00	0:07:00	0.000
13	0	0	0	1	1	2	13:08:00	13:17:00	0:09:00	0.222
14	0	1	0	0	1	2	13:19:00	13:27:00	0:08:00	0.250
15	0	0	1	0	0	1	13:29:00	13:37:00	0:08:00	0.125
16	0	1	0	0	0	1	13:39:00	13:52:00	0:13:00	0.077
17	0	0	0	0	0	0	13:55:00	14:03:00	0:08:00	0.000
18	0	4	4	2	0	10	14:04:00	14:15:00	0:11:00	0.909
19	5	25	14	16	4	64	14:18:00	14:34:00	0:16:00	4.000
20	1	0	8	4	2	15	14:37:00	14:49:00	0:12:00	1.250
TOTAL	15	44	50	56	36	201			3:32:00	0.719

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 21

DISCOVERY INFORMATION

DATE: 07AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E						
1	0	0	0	0	0	0	8:58:00	9:10:00	0:12:00	0.000	
2	0	0	0	1	0	1	9:13:00	9:26:00	0:13:00	0.077	
3	0	0	0	0	0	0	9:29:00	9:37:00	0:08:00	0.000	
4	0	0	0	0	0	0	9:40:00	9:50:00	0:10:00	0.000	
5	0	0	0	0	0	0	9:53:00	10:02:00	0:09:00	0.000	
6	2	0	0	0	0	2	10:05:00	10:16:00	0:11:00	0.182	
7	1	0	0	0	0	1	10:17:00	10:29:00	0:12:00	0.083	
8	0	0	0	0	0	0	10:32:00	10:41:00	0:09:00	0.000	
9	0	0	0	0	0	0	10:51:00	11:00:00	0:09:00	0.000	
10	0	0	0	0	0	0	11:03:00	11:11:00	0:08:00	0.000	
11	0	0	0	0	0	0	11:15:00	11:22:00	0:07:00	0.000	
12	12	1	7	9	7	36	11:25:00	11:42:00	0:17:00	2.118	
13	12	6	1	1	1	21	12:54:00	13:08:00	0:14:00	1.500	
14	0	0	0	0	0	0	13:12:00	13:22:00	0:10:00	0.000	
15	0	0	0	0	0	0	13:25:00	13:34:00	0:09:00	0.000	
16	0	0	0	0	0	0	13:36:00	13:47:00	0:11:00	0.000	
17	0	0	0	0	0	0	13:52:00	14:01:00	0:09:00	0.000	
18	0	0	0	0	0	0	14:11:00	14:20:00	0:09:00	0.000	
19	0	0	0	0	0	0	14:22:00	14:29:00	0:07:00	0.000	
20	0	0	0	0	0	0	14:31:00	14:38:00	0:07:00	0.000	
TOTAL	27	7	8	11	8	61			3:21:00	0.198	

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 22

DISCOVERY INFORMATION

DATE: 24JUL83

DIRECTION WALKED:

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCILLAN

SWEEP	A	ARTIFACT B	COUNTS C	D	E	TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
1	4	4	1	1	3	13	10:42:00	11:00:00	0:18:00	0.722
2	1	3	0	1	2	7	11:02:00	11:13:00	0:11:00	0.636
3	8	13	5	6	1	33	11:15:00	11:35:00	0:20:00	1.650
4	1	7	1	2	10	21	11:37:00	11:51:00	0:14:00	1.500
5	0	12	7	2	7	28	11:54:00	12:14:00	0:20:00	1.400
6	2	1	0	1	7	11	12:16:00	12:30:00	0:14:00	0.786
7	4	16	11	2	2	35	13:30:00	13:49:00	0:19:00	1.842
8	1	1	1	1	2	6	13:51:00	14:02:00	0:11:00	0.545
9	0	1	0	1	2	4	14:04:00	14:15:00	0:11:00	0.364
10	1	2	0	0	3	6	14:17:00	14:29:00	0:12:00	0.500
11	1	2	0	0	1	4	14:31:00	14:39:00	0:08:00	0.500
12	2	1	1	3	1	8	14:41:00	14:54:00	0:13:00	0.615
13	4	0	0	1	2	7	14:57:00	15:09:00	0:12:00	0.583
14	0	0	1	2	4	7	15:11:00	15:23:00	0:12:00	0.583
15	0	0	2	1	2	5	15:26:00	15:35:00	0:09:00	0.556
16	4	22	1	2	2	31	15:39:00	15:56:00	0:17:00	1.824
17	0	1	0	0	0	1	15:58:00	16:07:00	0:09:00	0.111
18	0	5	2	0	0	7	16:09:00	16:18:00	0:09:00	0.778
19	1	3	1	1	2	8	16:21:00	16:32:00	0:11:00	0.727
20	11	7	2	0	5	25	16:34:00	16:49:00	0:15:00	1.667
TOTAL	45	101	36	27	58	267			4:25:00	0.894

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 23

DISCOVERY INFORMATION

DATE: 06JUL83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFICIENCY
	A	B	C	D	E					
1	1	3	0	4	3	11	8:23:00	8:36:00	0:13:00	0.846
2	3	11	2	42	1	59	8:39:00	8:53:00	0:14:00	4.214
3	7	14	15	4	4	44	8:56:00	9:08:00	0:12:00	3.667
4	2	2	2	3	1	10	9:10:00	9:20:00	0:10:00	1.000
5	2	2	1	2	11	18	9:24:00	9:33:00	0:09:00	2.000
6	3	3	2	12	7	27	9:37:00	9:46:00	0:09:00	3.000
7	3	2	3	1	2	11	9:50:00	9:57:00	0:07:00	1.571
8	0	0	0	0	0	0	10:00:00	10:08:00	0:08:00	0.000
9	5	0	1	3	0	9	10:11:00	10:20:00	0:09:00	1.000
10	2	7	8	3	10	30	10:25:00	10:38:00	0:13:00	2.308
11	3	0	0	2	4	9	10:42:00	10:50:00	0:08:00	1.125
12	0	0	1	1	3	5	10:55:00	11:03:00	0:08:00	0.625
13	1	1	1	1	5	9	11:07:00	11:15:00	0:08:00	1.125
14	9	3	5	4	1	22	11:18:00	11:27:00	0:09:00	2.444
15	0	2	0	0	1	3	12:50:00	13:00:00	0:10:00	0.300
16	3	1	0	1	2	7	13:04:00	13:15:00	0:11:00	0.636
17	1	1	0	0	0	2	13:18:00	13:32:00	0:14:00	0.143
18	0	0	1	1	1	3	13:35:00	13:44:00	0:09:00	0.333
19	0	0	0	0	0	0	13:50:00	13:59:00	0:09:00	0.000
20	0	0	0	0	0	0	14:00:00	14:08:00	0:08:00	0.000
TOTAL	45	52	42	84	56	279			3:18:00	1.317

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 24

DISCOVERY INFORMATION

DATE: 03AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	0	0	0	0	0	7:53:00	8:17:00	0:24:00	0.000
2	0	0	0	0	0	0	8:21:00	8:29:00	0:08:00	0.000
3	0	1	0	0	0	1	8:31:00	8:40:00	0:09:00	0.111
4	0	0	1	0	0	1	8:42:00	8:56:00	0:14:00	0.071
5	0	0	0	0	0	0	8:58:00	9:17:00	0:19:00	0.000
6	0	0	0	1	0	1	9:20:00	9:30:00	0:10:00	0.100
7	0	0	0	0	0	0	10:22:00	10:36:00	0:14:00	0.000
8	0	0	0	0	0	0	10:39:00	10:53:00	0:14:00	0.000
9	0	0	0	0	1	1	10:56:00	11:08:00	0:12:00	0.083
10	0	0	0	0	1	1	11:11:00	11:22:00	0:11:00	0.091
11	0	0	0	0	0	0	12:34:00	12:52:00	0:18:00	0.000
12	0	0	0	0	0	0	12:55:00	13:09:00	0:14:00	0.000
13	0	0	0	0	0	0	13:13:00	13:26:00	0:13:00	0.000
14	0	0	0	0	0	0	13:29:00	13:42:00	0:13:00	0.000
15	0	0	0	0	0	0	13:45:00	13:55:00	0:10:00	0.000
16	0	0	0	0	0	0	13:57:00	14:11:00	0:14:00	0.000
17	0	1	1	0	1	3	14:14:00	14:34:00	0:20:00	0.150
18	0	0	0	1	0	1	14:37:00	14:48:00	0:11:00	0.091
19	0	0	0	0	0	0	14:50:00	15:01:00	0:11:00	0.000
20	0	3	0	0	0	3	15:03:00	15:17:00	0:14:00	0.214
TOTAL	0	5	2	2	3	12			4:33:00	0.046

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 25

DISCOVERY INFORMATION

DATE: 07AUG83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	0	4	0	0	0	4	9:47:00	9:58:00	0:11:00	0.364
2	0	1	1	0	1	3	10:01:00	10:13:00	0:12:00	0.250
3	0	0	0	0	1	1	10:15:00	10:24:00	0:09:00	0.111
4	0	0	0	0	0	0	10:26:00	10:35:00	0:09:00	0.000
5	0	0	1	0	0	1	10:37:00	10:46:00	0:09:00	0.111
6	1	1	0	0	3	5	10:48:00	11:00:00	0:12:00	0.417
7	0	1	0	0	0	1	11:15:00	11:25:00	0:10:00	0.100
8	0	0	0	0	0	0	11:28:00	11:37:00	0:09:00	0.000
9	3	5	3	3	1	15	11:38:00	11:51:00	0:13:00	1.154
10	7	0	3	0	0	10	11:53:00	12:08:00	0:15:00	0.667
11	0	2	0	1	0	3	13:08:00	13:19:00	0:11:00	0.273
12	1	0	0	1	0	2	13:22:00	13:35:00	0:13:00	0.154
13	0	3	3	2	1	9	13:38:00	13:51:00	0:13:00	0.692
14	5	11	3	0	1	20	13:54:00	14:14:00	0:20:00	1.000
15	11	6	4	2	54	77	14:17:00	14:44:00	0:27:00	2.852
16	10	11	8	18	8	55	14:47:00	15:04:00	0:17:00	3.235
17	20	35	13	17	20	105	15:15:00	15:53:00	0:38:00	2.763
18	7	12	7	11	11	48	15:57:00	16:16:00	0:19:00	2.526
19	12	6	1	7	14	40	16:18:00	16:34:00	0:16:00	2.500
20	3	1	1	0	3	8	16:36:00	16:49:00	0:13:00	0.615
TOTAL	80	99	48	62	118	407			4:56:00	0.989

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 26

DISCOVERY INFORMATION

DATE: 06JUL83

DIRECTION WALKED: EAST-WEST

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: SYLVIA MILLER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
	A	B	C	D	E					
1	5	3	6	4	8	26	15:01:00	15:15:00	0:14:00	1.857
2	0	3	2	0	6	11	15:20:00	15:30:00	0:10:00	1.100
3	1	0	3	6	3	13	15:36:00	15:58:00	0:22:00	0.591
4	0	0	0	0	0	0	16:05:00	16:25:00	0:20:00	0.000
5	5	4	5	3	2	19	8:20:00	8:32:00	0:12:00	1.583
6	28	13	24	7	9	81	8:35:00	8:56:00	0:21:00	3.857
7	16	8	6	0	2	32	8:59:00	9:20:00	0:21:00	1.524
8	0	3	3	1	0	7	9:23:00	9:36:00	0:13:00	0.538
9	1	0	0	1	3	5	9:40:00	9:51:00	0:11:00	0.455
10	5	1	1	1	1	9	9:55:00	10:08:00	0:13:00	0.692
11	2	5	3	2	2	14	10:12:00	10:25:00	0:13:00	1.077
12	0	3	1	1	0	5	10:30:00	10:43:00	0:13:00	0.385
13	5	7	7	0	7	26	13:08:00	13:18:00	0:10:00	2.600
14	9	0	5	2	11	27	13:22:00	13:35:00	0:13:00	2.077
15	5	3	2	4	9	23	13:38:00	13:54:00	0:16:00	1.438
16	2	2	2	12	5	23	14:00:00	14:15:00	0:15:00	1.533
17	6	2	2	1	0	11	14:20:00	14:31:00	0:11:00	1.000
18	0	0	0	0	0	0	14:35:00	14:45:00	0:10:00	0.000
19	7	5	1	0	0	13	15:45:00	15:52:00	0:07:00	1.857
20	0	0	1	1	1	3	15:55:00	16:09:00	0:14:00	0.214
TOTAL	97	62	74	46	69	348			4:39:00	1.219

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

DISCOVERY INFORMATION

DATE: 25JUL83

DIRECTION WALKED: NORTH-SOUTH

SWEEP POSITIONS:

A: TOM PEEBLES
 B: COLIN GARVEY
 C: KAREN KRAMER
 D: ETHAN GELL
 E: BILL MCMILLAN

SWEEP	A	ARTIFACT COUNTS					TOTAL	BEGIN TIME	ENDING TIME	SWEEP TIME	EFFIC- IENCY
		B	C	D	E						
1	1	0	0	2	1	4	9:15:00	9:28:00	0:13:00	0.308	
2	0	1	0	1	5	7	9:30:00	9:43:00	0:13:00	0.538	
3	0	0	5	1	6	12	9:45:00	9:57:00	0:12:00	1.000	
4	30	67	23	17	7	144	10:00:00	10:42:00	0:42:00	3.429	
5	16	11	9	33	16	85	10:51:00	11:29:00	0:38:00	2.237	
6	20	11	16	12	10	69	11:37:00	12:05:00	0:28:00	2.464	
7	18	15	19	19	12	83	13:12:00	13:42:00	0:30:00	2.767	
8	3	5	11	17	11	47	13:46:00	15:01:00	1:15:00	0.627	
9	2	4	2	3	2	13	15:04:00	15:28:00	0:24:00	0.542	
10	8	4	5	7	5	29	15:31:00	16:00:00	0:29:00	1.000	
11	17	17	26	20	14	94	9:43:00	10:19:00	0:36:00	2.611	
12	15	21	14	23	45	118	10:28:00	11:27:00	0:59:00	2.000	
13	21	21	23	21	29	115	11:36:00	12:37:00	1:01:00	1.885	
14	15	26	18	21	16	96	12:40:00	13:21:00	0:41:00	2.341	
15	16	16	16	88	55	191	14:19:00	15:11:00	0:52:00	3.673	
16	10	7	4	16	15	52	15:15:00	15:53:00	0:38:00	1.368	
17	7	9	3	13	8	40	9:09:00	0:09:36	-8:59:24	-.074	
18	10	7	11	19	25	72	9:40:00	10:20:00	0:40:00	1.800	
19	5	2	9	0	6	22	10:24:00	10:55:00	0:31:00	0.710	
20	2	3	2	2	3	12	10:57:00	11:21:00	0:24:00	0.500	
21	1	3	4	3	8	19	11:40:00	12:00:00	0:20:00	0.950	
22	10	13	6	19	10	58	12:03:00	12:34:00	0:31:00	1.871	
23	6	1	3	2	5	17	13:35:00	14:00:00	0:25:00	0.680	
TOTAL233	264	229	359	314	1399				3:42:36	1.532	

EFFICIENCY=ARTIFACTS FOUND PER MINUTE

BLANK PAGE

APPENDIX III
Grid Descriptions

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 2

GRID 1 DESCRIPTION

DATE 7-22-83

RECORDERS SLL/AGH/SRM

DIMENSIONS 29 M. X 26 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	521.18	489.01	102.71
NORTHWEST	498.07	476.98	102.26
SOUTHEAST	531.00	463.00	101.60
SOUTHWEST	509.97	451.09	101.86

COMMENTS: knoll-top location; relief of up to 1 meter

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 2

GRID 2 DESCRIPTION

DATE 7-22-81

RECORDERS SLI/AGH/SPM

DIMENSIONS 20 M. X 8 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	569.15	305.58	102.13
NORTHWEST	561.43	303.33	102.12
SOUTHEAST	576.68	288.26	101.88
SOUTHWEST	569.00	286.50	101.87

COMMENTS: knoll-top location on which the grid slopes to the north and to the south; relief of perhaps 1 meter

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 4

GRID 1 DESCRIPTION

DATE 8-24/25-83

RECORDERS SLL/SRM/KK/CG

DIMENSIONS 21 M. X 40 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	255.79	246.65	92.41
NORTHWEST	217.69	258.09	92.61
SOUTHEAST	249.95	226.46	91.67
SOUTHWEST	211.63	237.95	91.98

COMMENTS: located on low dune with gentle slope from north to south

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 4

GRID 2 DESCRIPTION

DATE 8-25-83

RECORDERS SLL/KK/CG/SRM

DIMENSIONS 10 M. X 12 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	305.93	221.52	92.06
NORTHWEST	294.20	223.84	91.94
SOUTHEAST	303.97	211.83	91.72
SOUTHWEST	292.20	214.08	91.53

COMMENTS: topography: on very gentle south slope of dune

vegetation: grasses and sparse brush

FCR- sparse distribution of small pieces

Note: many of the flakes are partially or completely
buried since the unit was red-flagged.

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 4

GRID 3 DESCRIPTION

DATE 8-25-83

RECORDERS SLL/CG/KK/SRM

DIMENSIONS 20 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	375.93	200.70	92.43
NORTHWEST	357.15	193.98	91.76
SOUTHEAST	383.18	179.98	91.53
SOUTHWEST	364.25	173.22	91.24

COMMENTS: Soil: slightly crusted sand

Topography: very gentle slope from north to south

Vegetation: sparse

FCR: sparsely scattered small pieces

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 4

GRID 4 DESCRIPTION

(GRID 4 DESCRIPTION)

DATE 8-25-83

RECORDERS SLL/SRM/KK/CG

DIMENSIONS 30 M. X 26 M. (Grid 4)
10 26 (Grid 5)

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST (5)	466.40	130.32	91.71
NORTHWEST (5)	440.78	141.47	91.28
SOUTHEAST (4)	449.46	94.13	90.42
SOUTHWEST (4)	423.75	105.24	90.20

COMMENTS: Grid 5 lies immediately (indeed, abutts) to the north of Grid 4; only the north corners of Grid 5 and the south corners of Grid 4 were shot

this grid system lies on the south face of a low dune and gently slopes from north to south

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 6

GRID 1 DESCRIPTION

DATE 7-25-81

RECORDERS ELL/DM/AGH/JRM

DIMENSIONS .6 M. X .5 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	587.50	156.43	99.48
NORTHWEST	581.07	156.87	99.45
SOUTHEAST	581.72	151.93	99.46
SOUTHWEST	586.73	151.51	99.47

COMMENTS: Topography: flat

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 6

GRID 2 DESCRIPTION

DATE 7-25-81

RECORDERS SLL/DM/ACH/SMH

DIMENSIONS 20 M. X 5 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	290.45	247.08	99.60
NORTHWEST	287.54	251.08	99.58
SOUTHEAST	275.02	234.60	99.37
SOUTHWEST	271.99	238.60	99.45

COMMENTS: topography: flat

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 6

GRID 3 DESCRIPTION

DATE 7-25-83

RECORDERS ELL/AGH/DM/5RM

DIMENSIONS 12 M. X 3 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	112.15	126.61	96.10
NORTHWEST	109.05	127.87	96.02
SOUTHEAST	107.64	115.44	95.98
SOUTHWEST	104.92	116.69	95.91

COMMENTS: topography: flat

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 1 DESCRIPTION

DATE 7-19-81

RECORDERS BLI/BBH

DIMENSIONS 18 M. X 18 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	414.92	337.20	97.54
NORTHWEST	397.59	332.30	97.31
SOUTHEAST	419.79	321.02	97.44
SOUTHWEST	402.52	315.02	97.40

COMMENTS: first grid laid out this season

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 2 DESCRIPTION

DATE 7-19-83

RECORDERS SLI/SM

DIMENSIONS 12 M. X 12 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	415.12	309.47	97.23
NORTHWEST	403.22	309.23	97.23
SOUTHEAST	415.75	297.50	97.17
SOUTHWEST	403.75	298.35	97.22

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 0

GRID 3 DESCRIPTION

DATE 7-19-83

RECORDERS SLI/SM

DIMENSIONS 22 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	414.20	280.63	97.18
NORTHWEST	394.37	289.70	97.23
SOUTHEAST	405.41	260.57	97.01
SOUTHWEST	385.40	269.59	97.17

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 5 DESCRIPTION

DATE 7-20-83

RECORDERS SLI/SRM/AGH/CG

DIMENSIONS 26 M. X 26 M.

CORNER COORDINATES

GRID CORNERS

X Y Z

NORTHEAST	197.18	297.80	92.49
NORTHWEST	171.52	302.10	92.39
SOUTHEAST	193.13	272.17	92.14
SOUTHWEST	167.52	276.23	91.94

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 6 DESCRIPTION

DATE 7-20-83

RECORDERS SLL/BRM/CG/AGH

DIMENSIONS 10 M. X 9 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	191.65	235.44	91.99
NORTHWEST	183.68	239.78	91.94
SOUTHEAST	187.74	226.62	91.99
SOUTHWEST	179.55	230.61	91.75

COMMENTS: topography: slope from east to west with perhaps
a relief of .5 meters

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 7 DESCRIPTION

DATE 7-20-83

RECORDERS SLL/ACH/BRM/CG

DIMENSIONS 6 M. X 6 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	125.50	119.31	92.10
NORTHWEST	119.88	121.30	92.01
SOUTHEAST	123.65	113.63	92.56
SOUTHWEST	117.91	115.61	92.45

COMMENTS: grid terrain slopes from south to north; the south edge is near a grassy stabilized dune area which grades into a barren blowout

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 8 DESCRIPTION

DATE 7-21-81

RECORDERS SLL/SRM/AGH

DIMENSIONS 31 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	126.47	190.95	91.89
NORTHWEST	112.15	207.50	92.05
SOUTHEAST	103.43	171.22	92.21
SOUTHWEST	88.90	187.68	92.20

COMMENTS: abutts Grid 9 to the east (which in turn abutts Grid 10 to the east); this grid system is in a shallow blowout between low dunes on the north and south; perhaps as much as 1 meter of relief throughout the contiguous grids as low dune fingers are present; vegetation varies from clumps of greasewood and grasses to barren areas

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 9 DESCRIPTION

DATE 7-21-83

RECORDERS SLL/SRM/AGH

DIMENSIONS 31 M. X 30 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	146.27	168.41	91.58
NORTHWEST	126.47	190.95	91.89
SOUTHEAST	123.31	148.84	91.53
SOUTHWEST	103.43	171.22	92.21

COMMENTS: this grid lies between Grid 8 to the west and Grid 10 to the east; see Grid 8 Description for notes on topography and vegetation

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 10 DESCRIPTION

DATE 7-21-83

RECORDERS SLL/SRM/AGH

DIMENSIONS _____ M. X _____ M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	166.07	145.87	91.50
NORTHWEST	146.27	168.41	91.58
SOUTHEAST	143.20	126.30	93.18
SOUTHWEST	123.31	148.84	91.53

COMMENTS: this grid lies just to the east of Grid 9;
see Grid 8 description for additional comments

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 8

GRID 11 DESCRIPTION

DATE 7-21-83

RECORDERS SLL/AGH/SRM

DIMENSIONS 30 M. X 30 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	164.07	517.69	98.08
NORTHWEST	136.79	529.80	98.41
SOUTHEAST	151.88	490.36	97.01
SOUTHWEST	124.35	502.57	97.28

COMMENTS: gentle slope from north to south-southeast

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 10

GRID 1 DESCRIPTION

DATE 8-6-83

RECORDERS SLL/AGH/BC

DIMENSIONS 13 M. X 23 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	602.96	419.90	98.91
NORTHWEST	582.32	430.09	99.00
SOUTHEAST	596.19	407.72	98.80
SOUTHWEST	575.51	417.79	98.79

COMMENTS: flat playa bottom

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 10

GRID 2 DESCRIPTION

DATE 8-7-83

RECORDERS SLI/BC/BRM/DPH/LAW

DIMENSIONS 8 M. X 12 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	539.51	309.67	97.74
NORTHWEST	529.92	317.02	97.70
SOUTHEAST	534.31	303.66	97.60
SOUTHWEST	524.73	310.95	97.54

COMMENTS: flat sandy dune area

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 10

GRID 3 DESCRIPTION

DATE 8-8-83

RECORDERS SLI/DDM/SRH/LAW/BC

DIMENSIONS 13 M. X 4 M.

CORNER COORDINATES

GRID CORNERS

X

Y

Z

NORTHEAST

383.96

116.15

96.34

NORTHWEST

380.34

114.32

96.42

SOUTHEAST

389.44

104.39

96.19

SOUTHWEST

385.88

102.51

96.27

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 10

GRID 4 DESCRIPTION

DATE 8-8-83

RECORDERS SLI/DDM/LAW/SRM/BC

DIMENSIONS 2 M. X 13 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	174.71	114.97	97.46
NORTHWEST	162.80	116.34	96.72
SOUTHEAST	173.96	107.86	97.50
SOUTHWEST	161.92	109.40	96.80

COMMENTS: located on west slope of dune; sloping considerably from east to west

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 1 DESCRIPTION

DATE 8-22-81

RECORDERS SLI/SRM/KK/CG

DIMENSIONS 10 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	166.11	299.24	82.63
NORTHWEST	145.62	290.65	81.27
SOUTHEAST	178.20	271.73	81.57
SOUTHWEST	157.81	263.27	80.34

COMMENTS: located on west slope of dune with slope from north to east; Grid 2 abutts to the north (which abutts with Grid 3 to the north); soils are sandy and vegetation consists of evenly spaced, relatively sparse sagebrush; FCR consists of cobbles and large cobble fragments (few small pieces, almost no flakes)

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 2 DESCRIPTION

DATE 8-22-83

RECORDERS ALL/SHM/CG/KK

DIMENSIONS 30 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	153.96	326.65	83.77
NORTHWEST	133.71	318.05	81.89
SOUTHEAST	166.11	299.24	82.63
SOUTHWEST	145.62	290.65	81.27

COMMENTS: abutts Grid 1 to the south and Grid 3 to the north;
see Grid 1 description for notes on vegetation, etc.

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 3 DESCRIPTION

DATE 8-22-83

RECORDERS SLL/SRM/KK/CG

DIMENSIONS 8 M. X 22 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	150.76	334.01	83.77
NORTHWEST	130.48	325.56	82.52
SOUTHEAST	153.96	326.65	83.77
SOUTHWEST	133.71	318.05	81.89

COMMENTS: abutts Grid 2 to the south; see Grid 1 description
for additional comments

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 4 DESCRIPTION

DATE 8-22-83

RECORDERS SLL/SRM/KK/CG

DIMENSIONS 30 M. X 26 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	200.77	208.17	79.99
NORTHWEST	177.94	195.87	79.22
SOUTHEAST	214.94	181.72	79.60
SOUTHWEST	192.33	169.54	78.87

COMMENTS: abutts Grid 5 which lies to the north (and which in turn abutts Grid 6, also to the north)

topography: the grid system which includes Grids 4, 5, and 6 lies generally in a flat playa; at the east end, however, it slopes up the the west side of a dune

vegetation: sparse distribution of "skimpy" plants

FCR: cobbles and features seem to be mostly in eastern portion of grid system and here the FCR is larger; smaller chunks in western portion of grid system

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 5 DESCRIPTION

DATE 8-22-83

RECORDERS SLI/SM/KK/CG

DIMENSIONS 30 M. X 26 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	186.50	234.60	80.29
NORTHWEST	163.55	222.21	79.78
SOUTHEAST	200.77	208.17	79.99
SOUTHWEST	177.94	195.87	79.22

COMMENTS: this grid lies between Grid 4 to the south and Grid 6 to the north; see Grid 4 description for other pertinent comments

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 6 DESCRIPTION

DATE 8-22-83

RECORDERS SLL/SRM/KK/CG

DIMENSIONS 12 M. X 26 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	180.71	245.16	80.44
NORTHWEST	157.92	232.82	79.84
SOUTHEAST	186.50	234.60	80.29
SOUTHWEST	163.55	222.21	79.78

COMMENTS: this grid abutts Grid 5 which lies to the south;
see Grid 4 description for further comments

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 19

GRID 7 DESCRIPTION

DATE 8-23-83

RECORDERS ALL/SRM/KK/CG

DIMENSIONS 10 M. X 8 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	563.46	475.23	88.95
NORTHWEST	555.69	473.18	88.48
SOUTHEAST	565.87	465.56	89.10
SOUTHWEST	558.19	463.53	88.62

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 20

GRID 1 DESCRIPTION

DATE 8-23-83RECORDERS SLL/CGDIMENSIONS 14 M. X 18 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	389.45	576.00	95.16
NORTHWEST	371.67	573.00	94.51
SOUTHEAST	391.80	562.14	93.64
SOUTHWEST	374.01	559.27	93.12

COMMENTS: the south line of this grid lies in a small gully; the grid slopes abruptly from the north atop a dune down into the gully; sheet sand starts at about North 4-6 and grades into sandy clay in the gully; vegetation is sparse (mostly grasses); FCR is small to medium sized pieces (few flakes)

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 20

GRID 2 DESCRIPTION

DATE 8-23-83

RECORDERS SLL/CG/SRM/KK

DIMENSIONS 26 M. X 12 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	143.56	593.58	90.42
NORTHWEST	131.83	595.89	90.02
SOUTHEAST	138.77	568.11	90.53
SOUTHWEST	126.78	570.32	90.16

COMMENTS: topography: low hummocky dune surrounded by grease-wood floodplain; dune is poorly defined; large bushes in grid obscure ground

artifacts: small broken thinning flakes and sparse FCR; probably some flakes are buried as foot-churning in the grid misrepresents what was originally flagged

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 22

GRID 1 DESCRIPTION

DATE 7-25-83

RECORDERS SLL/AGH/SRM/DDM

DIMENSIONS 4 M. X 11 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	263.71	114.57	90.92
NORTHWEST	265.24	125.45	90.81
SOUTHEAST	259.81	115.43	90.93
SOUTHWEST	261.60	126.29	90.87

COMMENTS: topography- flat

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 22

GRID 2 DESCRIPTION

DATE 7-25-83

RECORDERS SLL/SRM/AGH

DIMENSIONS 6 M. X 3 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	494.20	317.93	95.29
NORTHWEST	493.04	323.73	95.38
SOUTHEAST	491.54	317.17	95.24
SOUTHWEST	490.22	323.04	95.24

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 25

GRID 1 DESCRIPTION

DATE 8-16-81

RECORDERS SLI/SMH/DDM/LAW/CU

DIMENSIONS 31 M. X 62 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	224.92	266.04	84.68
NORTHWEST	163.00	262.91	86.14
SOUTHEAST	226.77	236.07	85.05
SOUTHWEST	164.86	232.23	86.88

COMMENTS: dune crest lies approximately in center of grid running east-west; sandy dune blowouts and anthills are common; relief of from 1 to 1.5 meters within grid and vegetation varies from sage on the dunes to greasewood off the dune crest

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 25

GRID 2 DESCRIPTION

DATE 8-16-83

RECORDERS SLI/BRH/CG

DIMENSIONS 18 M. X 53 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	216.73	235.48	85.20
NORTHWEST	164.86	232.23	86.88
SOUTHEAST	218.43	218.99	85.47
SOUTHWEST	165.65	215.21	87.28

COMMENTS: dune gently slopes from west to east; relief of perhaps one meter; few or no blowouts

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 25

GRID 3 DESCRIPTION

DATE 8-16-83

RECORDERS SLI/SHM/CG/KK

DIMENSIONS 30 M. X 18 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	164.16	244.27	86.90
NORTHWEST	146.37	243.29	87.19
SOUTHEAST	165.65	215.21	87.28
SOUTHWEST	147.59	213.80	87.84

COMMENTS: grid gently slopes to the east and lies on sheet sand; a road runs through the middle of the grid and PCR and artifacts are located on the radbed

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 1 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/AGH/CG

DIMENSIONS 11 M. X 9 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	505.85	414.58	99.37
NORTHWEST	492.37	414.03	99.18
SOUTHEAST	498.60	407.58	99.45
SOUTHWEST	492.32	414.01	99.18

COMMENTS: the south edge of this grid lies at the end of a dune and slopes to the north

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 2 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/AGH/CG

DIMENSIONS 10 M. X 6 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	503.06	392.50	99.66
NORTHWEST	497.13	393.70	99.65
SOUTHEAST	500.98	382.65	99.73
SOUTHWEST	495.10	383.98	99.59

COMMENTS: lies on the flat top of a dune

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 3 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/ACH/CG

DIMENSIONS 31 M. X 15 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	491.05	243.28	98.73
NORTHWEST	476.96	235.74	98.67
SOUTHEAST	505.59	217.11	98.79
SOUTHWEST	492.19	210.05	98.71

COMMENTS: generally flat with hummocks bearing greasewood;
slopes upward in the last 2 eastern meters

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 4 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/AGH/CG

DIMENSIONS 8 M. X 2 M.

CORNER COORDINATES

GRID CORNERS

X Y Z

NORTHEAST	451.72	216.77	98.61
NORTHWEST	444.74	212.51	98.66
SOUTHEAST	452.09	214.61	98.64
SOUTHWEST	445.20	210.56	98.74

COMMENTS: flat; note that the northern grid line was moved around 50 cm west so that the line would be parallel to the south line

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 5 DESCRIPTION

DATE 8-2-83

RECORDERS SLL/SRM/AGH/TCP

DIMENSIONS 17 M. X 13 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	238.04	582.03	96.69
NORTHWEST	225.00	583.39	96.42
SOUTHEAST	236.28	566.01	98.04
SOUTHWEST	223.45	567.57	97.60

COMMENTS: substantial slope from the terrace top to the north
to the terrace base on the south

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 6 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/AGH/CG

DIMENSIONS 16 M. X 30 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	441.05	216.47	99.08
NORTHWEST	411.16	221.54	98.84
SOUTHEAST	438.33	200.70	98.57
SOUTHWEST	408.81	205.72	98.67

COMMENTS: flat with greasewood and soil hummocks

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 7 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/SRM/AGH/CG

DIMENSIONS 4 M. X 6 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	326.39	319.75	99.20
NORTHWEST	321.97	315.72	99.35
SOUTHEAST	329.24	316.97	99.16
SOUTHWEST	324.91	312.92	99.32

COMMENTS: located on the east slope of a low dune, this grid slopes very gently from the west to the east

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 8 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/AGH/SRM/CG

DIMENSIONS 17 M. X 16 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	310.51	397.09	99.59
NORTHWEST	295.21	392.99	99.53
SOUTHEAST	314.60	381.59	99.77
SOUTHWEST	299.15	377.45	99.35

COMMENTS:

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT

UNIT 28

GRID 9 DESCRIPTION

DATE 7-27-83

RECORDERS SLL/AGH/SRM/CG

DIMENSIONS 13 M. X 12 M.

CORNER COORDINATES

GRID CORNERS	X	Y	Z
NORTHEAST	180.20	345.64	99.58
NORTHWEST	168.16	344.65	99.38
SOUTHEAST	180.94	333.70	99.90
SOUTHWEST	169.03	332.68	99.42

COMMENTS:

BLANK PAGE

APPENDIX IV
Field Forms

Daily Log

Date _____ Crew (circle one): Discovery
Mapping
Analysis

Crew Chief _____

Crew: _____

Ill/absent: _____

Truck license # _____ Ending mileage _____

Weather _____

Sample units _____

Summary of day's work:

starting time _____
ending time _____

Problems/suggestions:

Discovery Form

Date _____ Unit _____ Direction E/W N/S

Crew: A _____ D _____
 B _____ E _____
 C _____ F _____

Sweep #	Crew Member						Weather	Temp.	Time Begin	Time End
	A	B	C	D	E	F				
1 arts.										
feats.										
2 arts.										
feats.										
3 arts.										
feats.										
4 arts.										
feats.										
5 arts.										
feats.										
6 arts.										
feats.										
7 arts.										
feats.										
8 arts.										
feats.										
9 arts.										
feats.										
10 arts.										
feats.										
11 arts.										
feats.										
12 arts.										
feats.										
13 arts.										
feats.										
14 arts.										
feats.										
15 arts.										
feats.										
16 arts.										
feats.										
17 arts.										
feats.										
18 arts.										
feats.										
19 arts.										
feats.										
20 arts.										
feats.										
21 arts.										
feats.										
22 arts.										
feats.										
23 arts.										
feats.										
24 arts.										
feats.										
25 arts.										
feats.										

Comments on landform, vegetation

Feature Form

Sample Unit: _____ Date: _____

Recorders: _____

Shot # (s) _____

Dimensions in cm: L _____ X W _____

Firecracked rock: _____ 0-25 pieces present
_____ 25-50 " "
_____ 50-100 " "
_____ 100+ " "

Description (include material, type, tentative interpretation):

Depositional context

Condition and nature of disturbance

Drawn? yes _____ no _____ (Label shot #s on drawing)

Grid Record

Sample unit _____ Grid # _____ Date _____

Recorders _____

Size of grid squares _____ x _____ meters

Shot # coordinates of grid corners

1. _____ 2. _____
3. _____ 4. _____

Draw grid, label grid squares, shade in grids analyzed.

8

Figure 1

[illegible]

Figure 1

00000000 00000000 00000000

[illegible]

1000

00-00 000-000-00 000-000-00 000-000-00 000-000-00

Figure 1

[illegible][illegible]

100

10 99

1-800-368-5868

Flag Code
Name
Address
City
State
Zip
Telephone
Fax
E-mail
Web Site
Product Line
Material
Weight
Length
Width
Thickness
Color
Finish
Notes

458

BLANK PAGE

APPENDIX V
Field Form Codes

```

10 PROC FORMAT DDNAME=SASLIB PRINT;
20 VALUE $FLAG      0=ORANGE
30                  R=RED
40                  U,9=UNKNOWN;
50 VALUE TYPE       10=CORE
60                  11=BIPOLAR CORE
70                  12=SINGLE PLTFRM COR
80                  13=MULTIPLTFRM COR
90                  14=BLADE CORE
100                 20=ANGULAR DEBRIS
110                 30=FLAKE
120                  31=BIFACE THN FLK
130                  32=BIPOLAR FLAKE
140                  33=PRESSURE FLAKE
150                 40=TESTED COBBLE
160                  41=CHUNK/COBBLE
170                  42=UNIFACE
180                 50=BIFACE
190                  51=BIFACE 1
200                  52=BIFACE 2
210                  53=BIFACE 3
220                 60=FIRECRACKED ROCK
230                  61=FIRECRACKED ROCK FRAGMENT
240                 70=FEATURE
250                 80=OTHER
260                 90=ACULTURAL
270                  91=NOT AN ARTIFACT
280                  92=COULD NOT FIND
290                  93=NO ARTIFACTS;
300 VALUE GSTYPE    10=METATE
310                  11=SLAB METATE
320                  12=BASIN METATE
330                  13=BEDROCK METATE
340                  14=TROUGH METATE
350                  15=OTHER METATE
360                 20=MANO
370                  21=OVATE HANDSTONE
380                  22=SUBRECT HANDSTONE
390                  23=TWO HAND MANO
400                  28=OTHER MANO
410                 30=MORTAR
420                  31=BEDROCK MORTAR
430                 40=PESTLE
440                  41=WORKED SLAB
450                  42=ABRADER
460                  43=POLISHING STONE
470                  44=PECKING STONE
480                 50=HAMMERSTONE
490                  51=SPHERE HAMRSTONE
500                  52=DISK HAMRSTONE
510                  53=OBLONG HAMRSTONE
520                  54=IRREG HAMRSTONE
530                  55=OTHER HAMRSTON
540                 60=OTHER;

```


550	VALUE MATERIAL	1=CRYPTOCRYSTALLINE
560		2=GLASSY VOLCANICS
570		3=CRYSTALLIN VOLCANICS
580		4=SANDSTONE
590		5=OTHER SEDIMENTS
600		6=METAMORPHICS
610		8=OTHER
620		9=INDETERMINATE
630		10=QUARTZITE
640		11=QUARTZITIC SANDSTON
650		20=CHERT
660		21=CHALCEDONY;
670	VALUE COMPLETE	1=<1/2
680		2=>1/2
690		3=WHOLE
700		4=N/A
710		9=INDETERMINATE;
720	VALUE ILLUSTR	1=DRAWN
730		2=PHOTOD
740		3=COLLECTED
750		4=DRAWN & PHOTOD
760		5=DRAWN & COLLECTED;
770	VALUE CORTCOV	0=NONE
780		1=<'50%
790		2=>'50%
800		3=TOTAL
810		4=INDETERMINATE;
820	VALUE DSCAR	1=1
830		2=2
840		3=3
850		4=4
860		5=5
870		6=6
880		7=7
890		8=8
900		9=9 OR MORE;
910	VALUE PLATFORM	0=MISSING
920		1=CORTICAL
930		2=CRUSHED
940		3=SINGLE FACET
950		4=MULTIFACET
960		5=GROUND
970		8=OTHER
980		9=INDETERMINATE;
990	VALUE BREAKAGE	0=WHOLE
1000		1=TIP
1010		2=BASE
1020		3=MIDSECTION
1030		4=TIP CRUSHED
1040		5=TIP BROKEN
1050		6=BASE BROKEN
1060		7=REWORKED
1070		9=INDETERMNT FRAC;
1080	VALUE MOD	1=BIPAC MARG RET
1090		2=BIPAC MARG RET

1100		3=GROUND
1110		4=UNIFAC UT
1120		5=BIPAC UT;
1130	VALUE MODLOC	1=SIDE
1140		2=END
1150		3=END & SIDE
1160		4=ENTIRE EDGE
1170		9=INDETERMINATE;
1180	VALUE EDSHAPE	1=POINT
1190		2=SPUR
1200		3=NOTCH
1210		4=DENTICULATE
1220		5=CONCAVE
1230		6=CONVEX
1240		7=STRAIGHT
1250		8=IRREGULAR
1260		9=INDETERMINATE;
1270	VALUE EDGANGLE	1=<45 DEGREES
1280		2=>45 DEGREES;
1290	VALUE MODANGLE	1=<45 DEGREES
1300		2=>45 DEGREES;
1310	VALUE PCEDGMOD	0=NONE
1320	VALUE PC&EDGMOD	1=<'5%
1330		2='6-25%
1340		3='26-50%
1350		4='51-75%
1360		5='76-100%
1370		9=INDETERMINATE;
1380	VALUE GSPREP	0=NONE
1390		1=PECKED GRND SURF
1400		2=EDGES FLAKED/PECKED
1410		3=GROOVED
1420		8=OTHER
1430		9=INDETERMINATE;
1440	VALUE WORN SURF	1=UNIFACIAL
1450		2=BIFACIAL
1460		3=EDGE MARGINS
1470		8=OTHER
1480		9=INDETERMINATE;
1490	VALUE CSUTFACE	1=FLAT
1500		2=CONCAVE
1510		3=CONVEX
1520		4=FACETED
1530		5=ENDS POLISHD/BEVELD
1540		6=IRREGULAR
1550		8=OTHER
1560		9=INDETERMINATE;
1570	VALUE GSWEAR	1=GROUND
1580		2=BATTERED
1590		3=POLISHED
1600		4=CRUSHED
1610		5=STRIATIONS
1620		8=OTHER
1630		9=INDETERMINATE;
1640	VALUE CODER	1=LARRAIDE

17:30:27 03/05/84 75129|~v~fuzas|~~~~

BLANK PAGE

APPENDIX VI
Feature Forms

Feature Form

Sample Unit: 1 Date: 7/9/92

Recorders: Lavelle/Brown

Shot # (s) 10

Dimensions in cm: L 314 X W 255

Firecracked rock: ☐ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Small wood logs from a probable shipwreck or old pile,
ca 15 logs present, logs too small to ID as to kind of
wood or whether lumber.

Depositional context along surface of terrace top overlying
sediments to E

Condition and nature of disturbance intact, no other
disturbances

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 4 Date: 5/24/82

Recorders: SLC

Shot # (s) 25252 R51

Dimensions in cm: L 200 X W 100

Firecracked rock:

	0-25 pieces present
☒	25-50 "
☐	50-100 "
☐	100+ "

Description (include material, type, tentative interpretation):

Feature consists of a cluster of fire-cracked rocks and several are ashfall & burning debris. Most is small, white, porous. No charcoal is present. One hole was examined. Most of feature is within a 50 cm radius of 25252. #51052 more isolated pieces.

Depositional context is the slope of a dune.

Condition and nature of disturbance (if any) is almost completely buried

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 1 Date: 8/24/83

Recorders: SLK

Shot # (s) 6 856-857 860-864 870-879

Dimensions in cm: L ^{est} 900 X W 400

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature is an approximately 3m x 1.5m masonry wall. Firecracked
 found in 1944. Stone some pieces are present. Mostly
 as more abundant towards the S. The top of the wall is
 the most distinctive. It is a 1.5m x 1.5m area. The wall is
 3 m high. The present stone is 3 m high.

Depositional context Feature is in the 1.5m x 1.5m area. It is
 not a part of the wall.

Condition and nature of disturbance Feature is a masonry wall. It is
 mostly intact and shows no signs of disturbance.

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Shot #s define 1.5m x 1.5m area. It is a 1.5m x 1.5m area.

Feature Form

Sample Unit: 7 Date: 2/12/21

Recorders: Slawny/Hamman

Shot # (s) D-12

Dimensions in cm: L 3.5m X W 2.0m

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of 11 pieces of FCR scattered in angular L on N-facing slope of small drainage. Between 2 low hills. Surface manifestation - no depth as it is not a charcoal stone mounds! whole one all are of quartzite

Depositional context Surface

Condition and nature of disturbance Apparently completely displaced

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 7 Date: 7/13/82

Recorders: Garvey/Henry

Shot # (s) 0-13

Dimensions in cm: L 20 cm X W 20 cm

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

*Cluster of 8 small pieces of quartzite fire cracked rock.
Located near 0-12 on N slope of small hill. No charcoal
or ash or stained soil*

Depositional context *Surface*

Condition and nature of disturbance *Completely altered*

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 7 Date: 7/12/83

Recorders: Harvey/Chen

Shot # (s) D-41

Dimensions in cm: L 81 cm X W 42 cm

Firecracked rock: 0-25 pieces present
 25-50 " " *N/A*
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of 3 pieces of smooth wire, 4 black plastic gasket frags, 1 black rubber gasket frag, and 155 rusted, irregular metal fragments (possibly from a bolt of some sort?)

Depositional context *surface of wide flat area between low ridge and south of an arroyo*

Condition and nature of disturbance *no depth. water erosion in area*

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 8 Date: 7/20/83

Recorders: SL

Shot #(s) 695

Dimensions in cm: L 1.5 (N.W.) X W 50 (S.W.)

Firecracked rock: ☐ 0-25 pieces present
☒ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

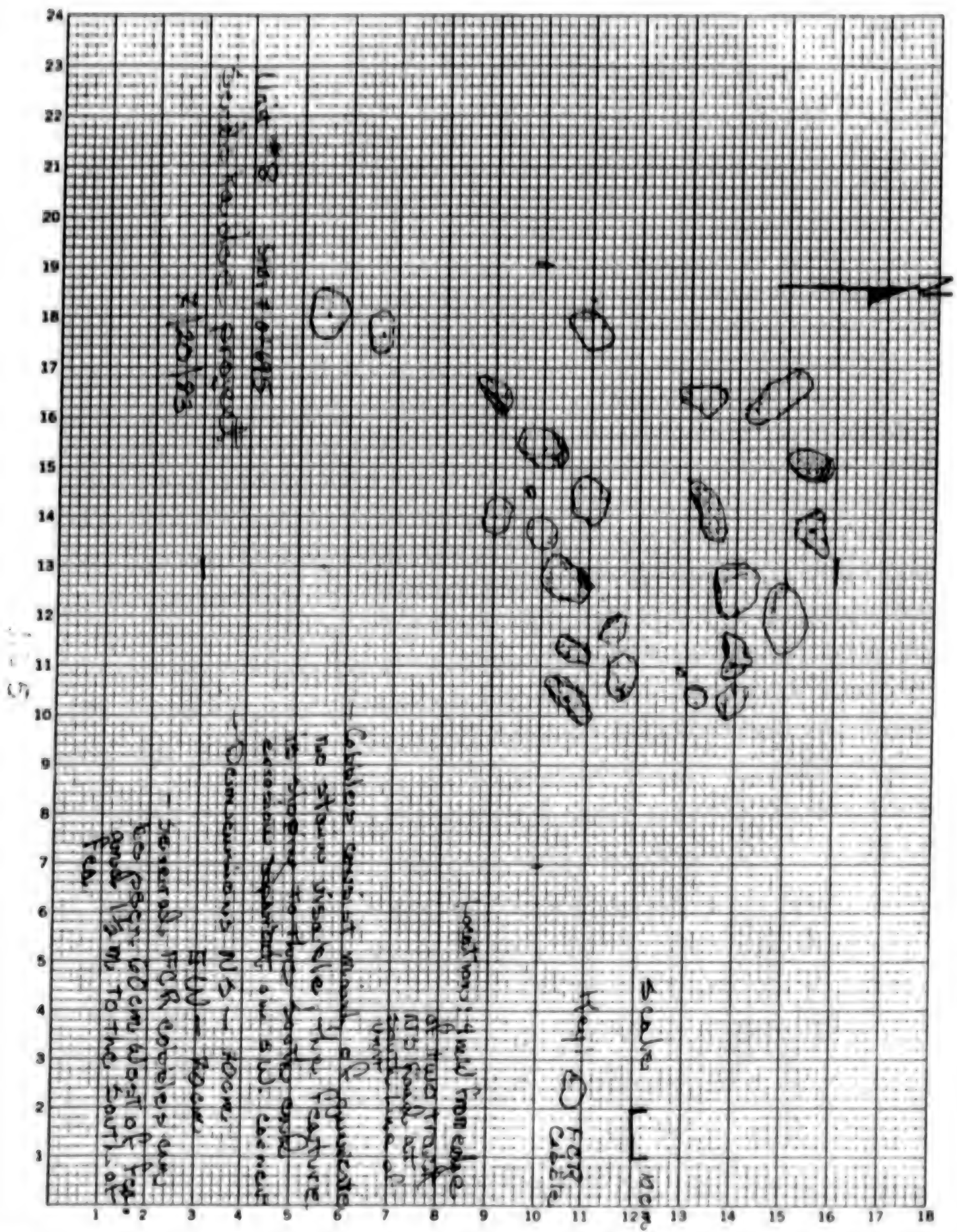
Feature is a cluster of quartzite in a band of firecracked rock. Some of the rock is in the middle of the band. Some of the rock is in the outer edges of the band.

Depositional context in the middle of the band of firecracked rock. Some of the rock is in the middle of the band. Some of the rock is in the outer edges of the band.

Condition and nature of disturbance it is a firecracked rock in the middle of the band.

Drawn? yes ☒ no ☐ (Label shot #s on drawing)

→ pick it.



Feature Form

Sample Unit: 10 Date: 8.4.83

Recorders: SPM

Shot #(s) 3 thru 8

Dimensions in cm: L 5m E-W X W 6m N-S

Firecracked rock: 0-25 pieces present
 25-50 " "
X 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Scatter of unknown type rock that appears firecracked & cracked. Some fine fractured quartzite cobble fragments. Possible hearth remnant but stone could be naturally weathered to this appearance. No carbon stained soil, chert & quartzite flakes present. Rock are exposed in small erosional wash. Little if any integrity. Strong likelihood that these locally occurring rocks are just that.

Depositional context moderate sloping W face of large dune
is a small interdunal playon.

Condition and nature of disturbance feature disturbed by sheetwash & minor gullywash downslope to the W.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 10 Date: 8-4-83

Recorders: SRM

Shot # (s) 47, 48, 49

Dimensions in cm: L 4m N-S X W 3m E-W

Firecracked rock: 0-25 pieces present
 x 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Fairly concentrated scatter of firecracked quartzite cobbles - most of which is large 1/2 or 3/4 cobble size pieces. Some chert cobbles as well. No carbon stained soil. Some integrity may exist sub-surface but most likely the feature has deflated out. (Possible hearth remnant)

tools associated w/ feature.

Depositional context Blown-out area between dunes - deflating down-dune to SE + small sandy deposit to SW.

Condition and nature of disturbance wind deflation of dunal surface and sheetwash downslope to the NW. Re-deposition of debris over feature also occurring

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 12 Date: 8/5/92

Recorders: SIL, CAM, AGH

Shot # (s) 250-259

Dimensions in cm: L 304 X W 10-304

Firecracked rock: 0-25 pieces present
25-50 "
50-100 "
✓ 100+ "

Description (include material, type, tentative interpretation):

Feature consists of a scatter of unconsolidated & granitic rock in a dense deposit. Direct interpretation is approx 7 m N-S x 5 m E-W & is located at the top of the deposit at the edge of the debris. In this area there are scattered clasts of quartz & granitic rocks are visible. (to the east) - a large (approx 10m x 30cm) L x 10cm W). The feature is not clearly a pavement. At the base of the slope there is a small depression.

Depositional context: This deposit is at the base of the debris slope. It is a small depression at the base of the slope.

Condition and nature of disturbance: Debris is unconsolidated & is not a pavement.

Drawn? yes ✓ no (Label shot #s on drawing) Sketch map on back

The feature is a scatter of unconsolidated & granitic rock in a dense deposit. It is located at the top of the deposit at the edge of the debris. In this area there are scattered clasts of quartz & granitic rocks are visible. (to the east) - a large (approx 10m x 30cm) L x 10cm W). The feature is not clearly a pavement. At the base of the slope there is a small depression.

SA
FIR
W

- Fig. 111
- ply 9
dune
- slip 100
- dense
sedimentary
rock surface
denser to be
more visible
- denser
for surface
more so,

Feature Form

Sample Unit: 12 Date: 5-20-83

Recorders: KK

Shot # (in) 42 (W), 44 (S), 52 (E), 50 (N) (Sum 46 47.00, 4)

Dimensions in cm: L 14m (N/S) x W 11m (E/W)

Firecracked rock: 0-25 pieces present

25-50	"	"
50-100	"	"
100+	"	"

Description (include material, type, tentative interpretation):

Concentration of fine-cracked rock. Pieces vary in size from cobbles to small fragments less than 20mm in length. Material type is predominantly quartzite with only a few pieces of sandstone. The densest configuration of F.C. and other cobbles is in the NE 1/4 of the feature's pass-outter. Only one artifact - listed cobble (12-50) was visibly associated. Depositional context Deformed matrix on slope 60° down to drainage, @ 150m up N slope from current

Condition and nature of disturbance

natural, deflated vehicle, ^{deflate} probably aff. by S. 1902

Drawn? yes___ no ☒ (Label shot is on drawing)

with feature F.C. ones continue in continuity
outside the frame as defined. Another
feature of F.C. are located about 20m up slope.

Feature Form

Sample Unit: 12 Date: 8-22-83

Recorder: SRM

Shot # (s) 60 (center of feature)

Dimensions in cm: L 10M SE-NW X W 2M (NE-SW)

Firecracked rock: 0-25 pieces present

<u>X</u>	25-50	"	"
<u> </u>	50-100	"	"
<u> </u>	100+	"	"

Description (include material, type, tentative interpretation):
 Very disturbed scatter of fine cracked quartzite cobbles and core. Probable
 hearth remnant. No carbon stained soil. Feature lies along crest
 edge of terrace lobe. Disturbance is great & very likely the original
 location of the FCR was located a meter or so up the slope to
 slightly more level ground. No integrity. Core #60 associated w/feature.

Depositional context Terrace lobe looking S-SE over broad drainage
 and just above E-W of smaller tributary drainage. Clay soil containing
 pleistocene outwash cobbles.

Condition and nature of disturbance Feature is being eroded downslope
 (E & SE) by sheetwash w/ some FCR fragments coming down to the
 small drainage to the E.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: _____ Date: _____

Recorders: 6/10/

Shot # (a) 25 - 6048 of 200

Dimensions in cm: L 2 (6.4) X W 1.5 (4.8)

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

While the 2005-06 season was the most successful in the history of the program, the 2006-07 season was the most difficult. The 2006-07 season was the most difficult because of the drought and the fact that the program was in its first year. The 2006-07 season was the most difficult because of the drought and the fact that the program was in its first year.

Depositional context *Low level, mid to late Pleistocene*

Condition and nature of disturbance

Drawn? yes no y (Label shot is on drawing)

Feature Form

Sample Unit: 15 Date: 7/19/82

Recorders: Harvey / Peckham / Herman

Shot # (s) 0231

Dimensions in cm: ☒ 1m high ☒ 75 m in diam

Firecracked rock: ☐ 0-25 pieces present N/A
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a cairn, composed of ca 100 sandstone slabs, dry laid in a circular shape, flat on top. A few (ca 12) have fallen off the top & lay beside the cairn on the ground.

Depositional context Surface located on small low point of bed underlying shallow drainage.

Condition and nature of disturbance A few slabs have fallen

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 15 Date: 2/18/82

Recorders: Sherry/Thurman

Shot #(s) Q-254 P 300 P 501

Dimensions in cm: L 22 X W 22

Firecracked rock: 0-25 pieces present
25-50 " " N/A
50-100 " "
100+ " "

Description (include material, type, tentative interpretation):

32 solder dot cans. 1 can lid, 1 metal button, and several pieces of sawed and cut wood scattered in sagbrush area north of cans, including shallow broad crannies in soil.

Depositional context Surface

Condition and nature of disturbance Apparently undisturbed except for weathering (shattered, crannies)

Drawn? yes no ✓ (Label shot #s on drawing)

Other list items in unit: 2 solder dot cans
1 can lid
3 Rem. #212 12 ga 2.75" .001

Feature Form

Sample Unit: 116 Date: 8.21.88

Recorders: KK

Shot # (s) 16-112(E) 16-91(W) 16-97(N) 16-94(S) SEE BELOW *

Dimensions in cm: L 17m(E/W) x W 11m(N/S)

Firecracked rock: ☒ 0-25 pieces present
☒ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Concentration of firecracked rock ^{feature} is fairly dispersed with only a slightly higher density in the southern half. Material type of F.C. is quartzite with one side of ventral. Created from the dispersion of rock with no visible concentration. Material type: quartzite characterized by disintegration. Occasional cobbles in the present F.C. may form primary.

Depositional context for:

shells on a slight slope - ground surface is not uniformly adjacent. Sand is present in some areas.

Condition and nature of disturbance

no visible non-homogeneous, some terrace cobbles
 - dispersed

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

* F.C. ^{shots} included in feature:

16-94, 96, 110, 111, 103
 101, 98, 105, 106, 107, 93,
 92, 109

Chipped stone shots:

0-91, 97, 112, 99, 100, 102, 108, 104

to tertiary. Another feature is situated about 10m to the E.

Feature Form

Sample Unit: 16 Date: 8-21-83

Recorders: SRM

Shot # (s) 134-135-136 (Top to bottom)

Dimensions in cm: 6.5M (NW-SE) x W 1M (N-S)

Firecracked rock: ☒ 0-25 pieces present
 ___ 25-50 " "
 ___ 50-100 " "
 ___ 100+ " "

Description (include material, type, tentative interpretation):

9 fire reddened + fire cracked anastomosing cobbles. No carbon staining nor associated artifacts. Possibly hearth remnant - appears to be eroding out of area just below the crest of the terrace loke. Some integrity may exist in this source location.

Depositional context gentle SE slope of lower sandy gravel/cobble terrace overlooking Green River Valley grasswood flats

Condition and nature of disturbance all materials located in sheetwash gully w/ linear distribution downslope to SE.

Drawn? yes ___ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 16 Date: 8-21-83

Recorders: SRM

Shot # (s) 1 & 2 (W edge of feature w/ feature extending N-S ~ .5m beyond endpoint)

Dimensions in cm: L 2 M E-W X W 2 M N-S

Firecracked rock: ☒ 0-25 pieces present
 ☐ 25-50 " "
 ☐ 50-100 " "
 ☐ 100+ " "

Description (include material, type, tentative interpretation):

15 fire cracked + fire reddened quartzite + sandstone cobbles. No associated artifacts. No carbon stained soil. Near larger scatter of FCR to the S, appears to be an eroded hearth remnant. This is a very favorable location (E-SE low slope just above old Green River Channel 200m away) yet chipped stone is relatively coarse compared to the FCR in this immediate area (If this particular location "used repeatedly over time, why not more chipped stone - or is this a one time utilization of a single band?).

Depositional context sandy gravel/pebble lower terrace lobe just W of above grasswood flats of the Green River valley. Very gentle slope.

Condition and nature of disturbance Siltwash. This lower terrace has been bisected by small washes + gullies, undoubtedly carrying away some of the cultural material. Possible that FCR is originating above & under upper terrace overburden + these concentrations (including this feature) are merely redeposited debris.

Drawn? yes ☐ no ☒ (Label shot is on drawing)

Feature Form

Sample Unit: 16 Date: 9/21/92

Recorders: SLC

Shot # (s) 8, 9, 10

Dimensions in cm: L 7 M X W 5 M

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a sand cluster of 20-30 small & irregularly shaped rocks at # 8 (11 kg per bag, including 1 small bag, which is 1 kg per bag), with scattered pieces of R at # 9 & # 10. No stamp is present.

Depositional context

Slope of first floor is steep. Feature is upper 10 m below (6 m) from the surface on a steep slope. Soil is pretty much sand.

Condition and nature of disturbance

Feature is exposed in a sand pit. It is a feature in a sand pit.

Drawn? yes ☒ no ☐ (Label shot #s on drawing)

← N

x
R

x = Shot # 8

= R

Not to scale, but dimensions are 9 m N/S x 5 m E/W

Feature Form

Sample Unit: 16 Date: 8/21/83

Recorders: SLC

Shot # (s) 115-122

Dimensions in cm: L 150 700 X W 500

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of an irregular, deep and shallow
excavation in the bedrock surface. The top of the
shallow is flat. The walls are more vertical on the
N end (up slope). The bottom is more irregular.
Feature formation.

Depositional context

appears to be a depression in the bedrock surface. The bottom is more irregular.
Short sand dune formation. A small sandy dune on the
N end.

Condition and nature of disturbance

(S) into the body. The walls are almost vertical.

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Note: Shot #s determine feature formation.

Feature Form

Sample Unit: 13 Date: 8/31/20

Recorders: SKL

Shot # (s) 132

Dimensions in cm: L 2 M X W 1 M

Firecracked rock: 0-25 pieces present
 25-50 " "
✓ 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature is a very concentrated cluster of FR, made up predominantly of whole & nearly whole quartzite cobbles. No siltstone is present. Cobbles are slightly rounded at the densest end (east). Abundancy may be due to erosion around feature. This is the densest cluster of FR in the unit.

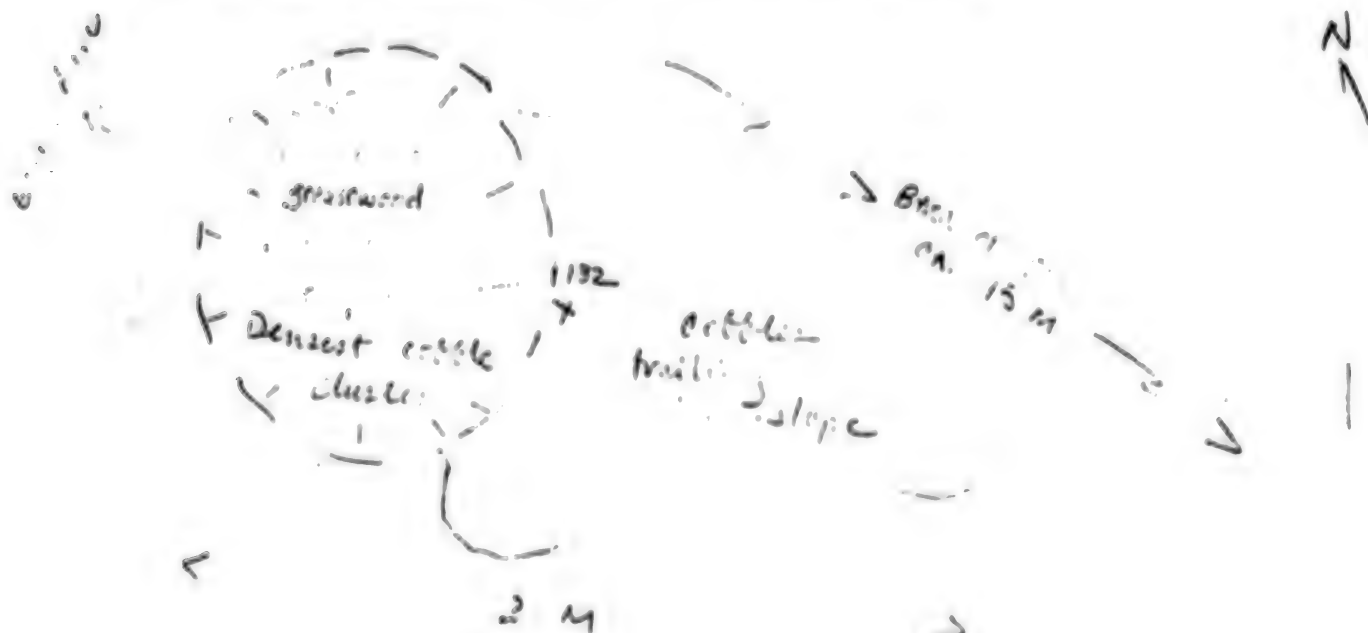
Depositional context

Feature is at the base of the unit, & is associated with the base of the unit.

Condition and nature of disturbance

Feature is probably eroded, & the densest cluster is at the base of the unit.

Drawn? yes ✓ no (Label shot #s on drawing)



Feature Form

Sample Unit: 40 Date: 8/21/83

Recorders: SLL

Shot # (s) 137-143

Dimensions in cm: L 12.00 X W 5.4

Firecracked rock: 0-25 pieces present

<u>✓</u>	25-50	"	"
<u>—</u>	50-100	"	"
<u>—</u>	100+	"	"

Description (include material, type, tentative interpretation):

Feature is a cluster of firecracked sandstone pebbles concentrated at the top of a slope + dispersed down slope. No staining is present. Approx. 100-150 pieces between #143 + 140-141 approx. 50 cm wide. From up slope to down slope, the size of the pebbles decreases.

Depositional context

Top of a sandstone unit. Remains of a clay (shale) (thin) bed at the base of the sandstone. (See drawing)

Condition and nature of disturbance

Feature is a ridge of pebbles + little downward, if any.

Drawn? yes no ✓ (Label shot #s on drawing)

Note: The feature is a ridge of pebbles + little downward, if any. The feature is a ridge of pebbles + little downward, if any.

Feature Form

Sample Unit: 14 Date: 2/21/83

Recorders: SLK

Shot #s) 3, 4, 12, 13, 14, 18-23, 25-27, 29, 32-34, 37-41, 28

Dimensions in cm: Length 35 m N-S X W 20 m E-W

Firecracked rock: 0-25 pieces present
 25-50 " "
✓ 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature is an extremely dispersed scatter of fragments or bits of
 grey, 1-2 cm pebbles; no stones are present. Density is slightly higher
 at the top of the slope. There are large - numerous white
 pebbles & large boulders present.

Depositional context

Feature is on slope - possibly a scarp
 of 1st Gila River terrace. Stone is present in the
 shaded gully - scattered apart here. Soil is sandy & light brown
 but some pebbles are seen in the feature. Pebbles are present.

Condition and nature of disturbance

Feature seems to be a result of human activity
 & is not a natural feature. No other stones at the site.

Drawn? yes no ✓ (Label shot #s on drawing)

aggregation). Pebbles are at
 the edge of the slope.

4/83. At least 2x as many rocks as present at a point at
 the upper edge of the slope. A road is nearby.
 The feature is a large white pebble scatter feature. Davis.

Feature Form

Sample Unit: 16 Date: 8-21-83

Recorders: SRM

Shot # (s) 66 (~NW corner of feature)

Dimensions in cm: L 2.5M (N-S) X W 2M E-W

Firecracked rock: ☒ 0-25 pieces present
 ☐ 25-50 " "
 ☐ 50-100 " "
 ☐ 100+ " "

Description (include material, type, tentative interpretation):

12 large pieces of fire-reddened + cracked quartzite cobbles w/
other, unmodified quartzite cobbles. Large ant-hill in center. No carbon
stained soil, no associated artifacts. Possible deflated-hearth.
Little likelihood of integrity remaining, Soil depth is shallow.

Depositional context clayey sand gravel/stone terrace like looking
E-Sb over Green River. Gentle slope below crest of this lower terrace.

Condition and nature of disturbance channeling, & structural erosion
as scattering the feature down slope to the east. Large ant-hill
disturbance. Also redeposition of soil & detritus from upslope.

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 16 Date: 8-21-83

Recorders: SLL, SRM, KK

Shot # (s) 117 thru 120

Dimensions in cm: L 9M (E-W) X W 5M (N-S)

Firecracked rock: 0-25 pieces present
 25-50 " "
 50-100 " "
165 100+ " "

Description (include material, type, tentative interpretation):
very thin but uniform scatter of small pieces of fire craked quartzite
cobble. No carbon staining & no associated artifacts. Possible hearth
remnant. Extensive exposure in all directions. No integrity remains.
Good locality for game look-out.

Depositional context on top of flat terrace like finger looking west
over dead dunes & swales toward Blackfoot valley.

Condition and nature of disturbance extremely windy point - deflation.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 17 Date: 8-8-84

Recorders: SKM

Shot # (s) 24 thru 27

Dimensions in cm: L 2ME-W X W 6N-N-S

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

12 pieces of fine cracked & fine reddened quartzite cobbles.
No carbon stained soil. Very scattered but possible
depleted beneath. One flake (#25)
No integrity due to disturbance.

Depositional context quartzite cobbles on slope of 0.2 all sandy wood shaded
gums on basalt terrace like.

Condition and nature of disturbance 2-track + some through scatter.
Sheetwash & deflation.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 17 Date: 8-9-83

Recorders: SPM

Shot # (s) 223 mm 235

Dimensions in cm: L 14m N-S X W 10m E-W (max.)

Firecracked rock: 0-25 pieces present
 25-50 " "
X 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

intense scatter of fire cracked & reddened quartzite cobbles w/ localized concentrations w/in the scatter. 100 Carbon stained soil. Numerous beds of flakes of quartzite! Chert w/in the feature boundaries and beyond. A good deal of disturbance is assumed to have scattered FCR, but some concentrated pockets exist. Since redeposition of sand from dune surface above is occurring, some integrity may remain subsurface but any deposition left here is quite shallow. This appears to be one large or several smaller deflated hearths.

Depositional context ^{on} gentle SE facing slope of deflating windward dune on top of cobbly wind terrace lobe. Feature located on terrace edge overlooking eroded dundee & face of another terrace landform.

Condition and nature of disturbance Shallow & deflation are exposing and covering surface & FCR. Feature appears to be washing downslope to the SE. Most fragments are partially embedded in fairly compacted sand.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 17 Date: 8-9-83

Recorders: SRM

Shot # (s) 35 thru 39

Dimensions in cm: L 2M N-3 x W 2M E-W

Firecracked rock: X 0-25 pieces present
 _____ 25-50 " "
 _____ 50-100 " "
 _____ 100+ " "

Description (include material, type, tentative interpretation):

11 large pieces of fire cracked quartzite whistles. No carbon stained soil. Possible hearth rim and also has become deflated. One quartzite flake associated w/ feature. Feature has been disturbed to the point that no integrity remains. There is a possibility that these FCR are actually associated w/ feature 24 cm 3m above & smaller FCR pieces washed down the largest cobble fragment manipulated fr. tool making. No flakes have been taken off any cobbles.

Depositional context gentle SE slope below wind-eroded dune to the west. Features exposed on surface because of recent pavement surface on broadened terrace slope.

Condition and nature of disturbance sheetwash & deflation.

Drawn? yes ___ no ___ (Label shot #s on drawing)

Feature Form

Sample Unit: 17 Date: 8-8-83

Recorder: SKM

Shot (s) 2 & 3

Dimensions in cm: L 4m N-S X W 1m E-W

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

although quartzite cobbles are ubiquitous, this scatter contains many f. is fractured & fine rounded quartzite cobbles & frags. No Carbon stained soil. Possible hearth remnant but no integrity remains as FCR are located in old gully which has since been captured by a larger one next to it (confidence level as to identification as FCR is low. Post fracture & differential weathering may be actual cause.)

Depositional context SW facing slope of bad lands area. Feature may have actually been located above & washed down to this location.

Condition and nature of disturbance gully & sheetwash. Terrain bisected by washes & gullies. FCR in linear concentration due to erosional redeposition.

Drawn? yes no (Label shot (s) on drawing)

Feature Form

Sample Unit: 17 Date: 8-8-83

Recorders: SRM

Shot # (s) 29 Area 32

Dimensions in cm: L 2m N-S X W 2m E-W

Firecracked rock: Y 0-25 pieces present

<u>Y</u>	25-50 "	"
<u>—</u>	50-100 "	"
<u>—</u>	100+ "	"

Description (include material, type, tentative interpretation):
 A concentration of fine cracked + fine reddened quartzite cobbles & sandstone pieces. No carbon stained soil. Some integrity may remain as it appears that deflation is exposing these pieces & covering others. Not as much migration of FCR as in several other type soil scalds on this unit.

Depositional context SE slope of deflation zone just W of wind-eroded dune on terrace lobe.

Condition and nature of disturbance wind deflation & sheetwash toward SE

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 17 Date: 8-8-83

Recorders: BC/ALL

Shot # (s) 125

Dimensions in cm: L 92 X W 110

Firecracked rock: ☒ 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

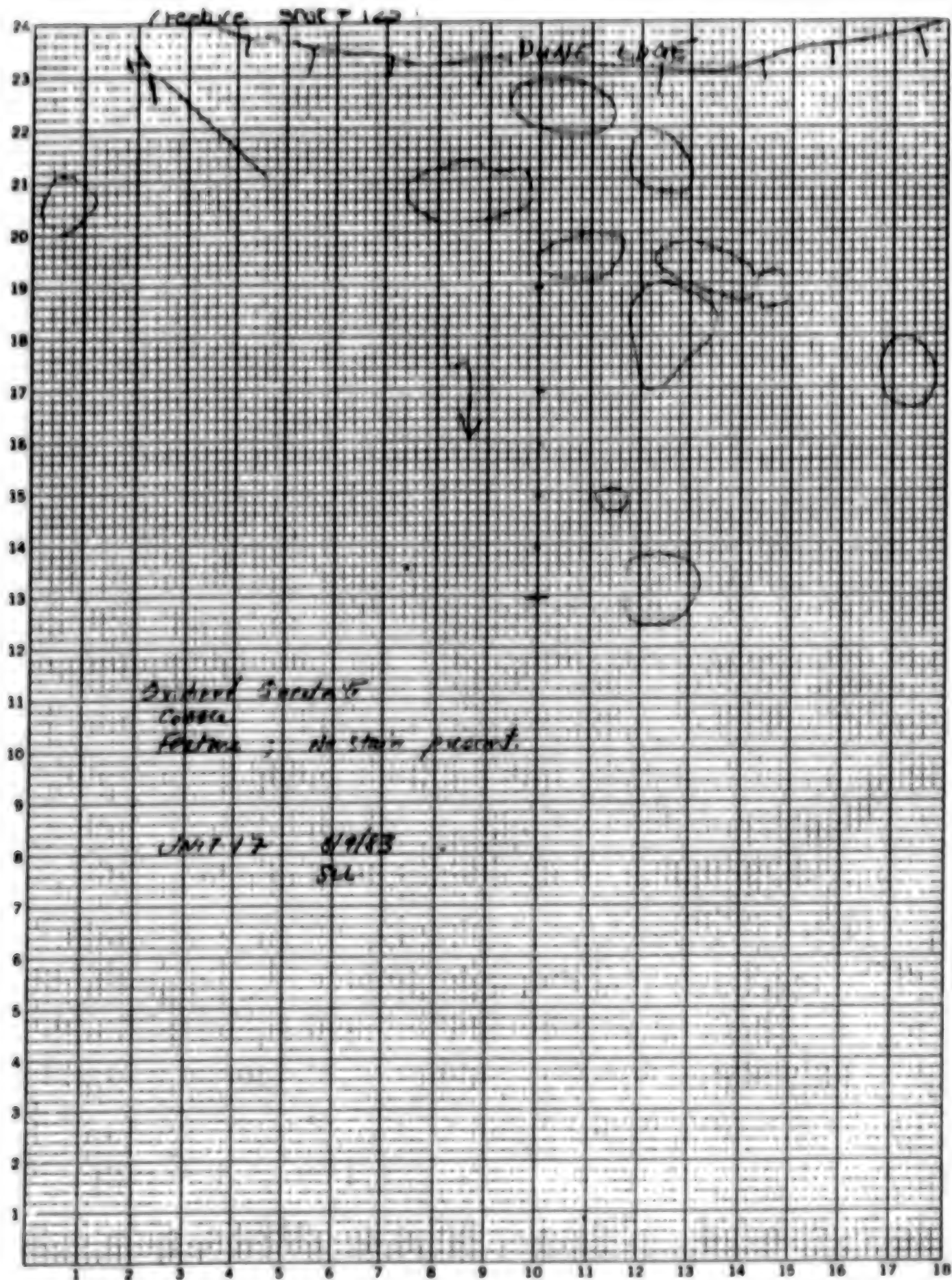
Description (include material, type, tentative interpretation):

Cluster of white and oxidized ^{firecracked} quartzite cobbles; amorphous in shape
no staining or charcoal is present. Fragments are large.

Depositional context. Located at the top edge of a dune, in a blowout
area, which is all on a mesa top. Ground surface is desert hard pan.

Condition and nature of disturbance deflating down slope

Drawn? yes ☒ no ☐ (Label shot #s on drawing)



Feature Form

Sample Unit: 19 Date: 8-22-83

Recorders: SRM

Shot # (s) 314 thru 317

Dimensions in cm: L 4M N-S X W 3.5M E-W

Firecracked rock: 0-25 pieces present
 25-50 " "
 X 50-100 " "
 100+ " "

~ 55

Description (include material, type, tentative interpretation):
discrete concentration of large fine reddened + fine cracked quartzite
cobbles. No carbon stained soil. No immediate associated artifacts.
Probable hearth remnant.

Depositional context exposed in lower part of S-facing blow-out of
large dune. Silty sand over isolable terrace. Feature is in overburden
just a few cm's deep at this locus

Condition and nature of disturbance wind deflation & sheetwash. Aggrading
from dune above also occurring.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 19 Date: 8-21-83

Recorders: SRM

Shot # (s) 56 & 57 (#56 in center & #57 at SW end)

Dimensions in cm: L 5.5M (NE-SW) X W 3M (SE-NW)

Firecracked rock: 0-25 pieces present

~85 X 25-50 " "
50-100 " "
100+ " "

Description (include material, type, tentative interpretation):

very discrete concentration of fire-cracked & fine reddened quartzite cobbles, most are whole & large pieces. No carbon stained soil. Associated artifacts are #55 & #116 (coal & utilized flakes). Appears to be a hearth remnant deflating & eroding out. Some integrity preserved through localized aggrading.

Depositional context ^{gentle} SW slope of windward dune in broken country.
Vincennes river long swales - good view of hinterland. Silty sand soil by
Good deposition

Condition and nature of disturbance sheetwash & deflation occurring but some aggrading as well.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 19 Date: 8-21-83

Recorders: SRM

Shot # (s) 302

Dimensions in cm: L 2 M E-W X W 1 M N-S

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

6 fire cracked + fine reddened quartzite cobbles eroding out of W side of large dune. Possible buried hearth debris. Associated expedient unifacial tool. No carbon present but it appears most of this feature remains buried.

Depositional context Silty sand of large dune - located on lower West slope.

Condition and nature of disturbance wind deflation + aggradation from above. Sheetwash

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 19 Date: 8-21-83

Recorders: SJM

Shot # (s) #136 thru 148 (entire distribution)

[#]136-140 Dimensions in cm: L 10M - SW/NE X W 5M - SE/NW

Firecracked rock: 0-25 pieces present
 25-50 " "
 50-100 " "
X 100+ " "

Description (include material, type, tentative interpretation):

Large scatter of fine-weathered + fire cracked quartzite cobbles w/ densest concentration dimensions given above as probable source heath of these materials. FCR are being scattered downlope by 2-track road & other smaller concentrations are seen up in the distribution. It is possible that more than 1-heath is represented but only the one measured shows any indication of integrity.

Depositional context West & windward face of tied dune - good amount of deposition remains at locus of densest concentration.

Condition and nature of disturbance sheetwash, a good deal deflation + massive disturbance of 2-track.

Drawn? yes no (Label shot #s on drawing)

Note: #148: 2 pieces of FCR outside of main concentration have carbonized sage & carbon stained sand underneath. These stones appear in 2-track rut wall & may be part of a heath still more completely buried in the dune.

Feature Form

Sample Unit: 19 Date: 8/21/83

Recorders: ELL

Shot # (s) 35, 36

Dimensions in cm: L 250 x W 75

Firecracked rock:

<u> </u>	0-25 pieces present
<u> </u>	25-50 " "
<u> </u>	50-100 " "
<u> </u>	100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a cluster of oxidized and firecracked cobbles. Most pieces represent 1/4 or less of the whole cobble. No staining is present. Approx. 30% are clustered within 50 cm of the #35 flag.

Depositional context On gentle upward slope at base of boulder. Soil is fine sand. Cobbles are highly visible although not very buried.

Condition and nature of disturbance Dependent on weathering.

Drawn? yes ☒ no ☐ (Label shot #s on drawing) Sketch not required.

55
x

50 cm

↓

↓
N

Not to scale

ca. 100

5' 10" 8.5

10' 10"

Feature Form

Sample Unit: 19 Date: 6/1/68

Recorder: SLK

Shot (s) 45-49, 72-74, 76

Dimensions in cm: L 200 X W 100

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a sparse scatter of oxidized copper and FC rubble from dispersed evenly over the above area. 6 whole rubble are present. The remaining pieces are small frags. No staining is present. Sparse flake & 1 whole as flake are associated.

Depositional context S sloping dune

Condition and nature of disturbance probable of feature

Drawn? yes ☒ no ☐ (Label shot (s) on drawing) 20 ft



Feature Form

Sample Unit: 40 Date: 2/22/83

Recorders: S-L

Shot # (s) 202-207

Dimensions in cm: L 400 X W 200

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a dispersed, amorphous scattering of small fragments of fire-cracked quartzite cobbles (typ. size 5 cm L). No staining is present, nor are any pebbles clastified. Cobble are distributed evenly over feature area. No staining is present. One hole is clearly associated with feature.

Depositional context: Feature is on bedrock of pebbly-sandstone clay. It is at base of 10 m by 10 m area of pebbly sandstone clay. It is surrounded by pebbly sandstone clay. No staining is present.

Condition and nature of disturbance: Feature is in good condition.

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Scale bar: 10 cm

Feature Form

Sample Unit: 20 Date: 8/25/82

Recorders: SLB

Shot # (s) 201

Dimensions in cm: L 200 X W 100

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 "
☐ 50-100 "
☐ 100+ "

Description (include material, type, tentative interpretation):

Feature consists of a small cluster of 11 rounded white-cracked
 cotton over an area approx. 20 cm x 40 cm at the edge of
 a shell sand covered terrace. 5 m. or so. is the present up to
 approx. 100 cm. diameter. The shavings in part of the terrace
 are not in any more visible. The feature is a
 small, white, cotton-like, no other things are present.

Depositional context

Feature is located on a small terrace, a relatively steep, of 10%
 (approx. 10% slope) facing.

Condition and nature of disturbance Feature is not disturbed

Drawn? yes ☐ no ☐ (Label shot #s on drawing) 201



Feature Form

Sample Unit: 22

Date: 7-26-83

Recorders: SRM

Shot # (s) 22-110 + 22-114

Dimensions in cm: L 450 X W 225

Firecracked rock: 0-25 pieces present
 25-50 " "
X 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Concentration of fractured quartzite cobbles - no whole cobbles present. Pieces are more exposed on steeply fractured fractures. No carbon staining present but fractured nature of stone is consistent with heat fracturing. Some isolated pieces of fractured rock are present beyond the concentration. Shrubwash is the major disturbance. Piece range in size from ~ 6 cm dia fragments to ~ 2 cm dia.

Depositional context FCR are exposed on gentle SE slope of low alluvial deposit. Some are buried & only partially exposed. FCR appear to follow a shrubwash runoff channel on slope.

Condition and nature of disturbance FCR distribution is disturbed by shrubwash & small scale run off channels. Redeposition of sandy soil obscures the full extent of the concentration.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 23 Date: 7/6/80

Recorders: Landolt/Herman

Shot # (s) Q7

Dimensions in cm: L as above X W

Firecracked rock: ☒ 0-25 pieces present none
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of two small rocky soil stains containing charcoal lying on 40 cm apart, the northern one measures 50 x 80 cm and the southern 45 x 39 cm

Depositional context Rocky soil (tan in color), surface

Condition and nature of disturbance Apparently disturbed by fence construction. One has 1.5 m north of area in which stone pit has been excavated with heavy equipment.
Drawn? yes no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 23 Date: 7/8/81

Recorders: Larry delaney

Shot # (s) 0-25

Dimensions in cm: L 840 X W 700

Firecracked rock: 0-25 pieces present N/A
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of scattered wood fragments of small branches, sticks, and branches.

Depositional context *Surface in pebbly sand*

Condition and nature of disturbance *Weathering - area affected by shot work*

Drawn? yes no / (Label shot #s on drawing)

Feature Form

Sample Unit: 23 Date: 7/8/81

Recorders: Larnald/Thurman

Shot # (s) R 143

Dimensions in cm: L 150 X W 100

Firecracked rock: ☒ 0-25 pieces present none
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Section consists of charcoal & ash stain, also small natural surface p. possible egg shell frag: on side as probable this of a bird's nest

Depositional context *surface on sandy pebbly soil*

Condition and nature of disturbance *weathered shell wash evident in area*

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

5

Feature Form

Sample Unit: 22 Date: 7/8/81

Recorders: Larsen/Hamm

Shot # (s) Rise

Dimensions in cm: L 90 X W 70

Firecracked rock: ☒ 0-25 pieces present none
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of ash and charcoal, plus ^{small} natural pebbles (burned). One 16oz can lid and one Alta Colby, sty occur in the hearth.

Depositional context Surface in pebbly sand

Condition and nature of disturbance Weathering, sheet wash
(minor), was observed in the past over the area

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 21 Date: 7/1/82

Recorders: Larsen & Hummer

Shot # (s) Disc

Dimensions in cm: L 168 X W 112

Firecracked rock:

☐	0-25 pieces present	N/A
☐	25-50 "	"
☐	50-100 "	"
☐	100+ "	"

Description (include material, type, tentative interpretation):

Feature consists of a scatter of wood fragments, including aged and saw lumber and branches.

Depositional context *surface of p. fly. sandy sil*

Condition and nature of disturbance *weathering (rotted wood)*

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 23 Date: 7/2/83

Recorders: SLL/AGM

Shot # (s) 4, 25, 29, 52

Dimensions in cm: L ca. 10 m X W 9 m

Firecracked rock: 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

large amorphous Shepherd's ^(?) wood pile w/ ca. 200+ small wood
logs, split & too small to determine whether split or not. At W end
is an ash & charcoal dump ca. 1 m in diameter (Shot # 52 is at
N edge). Surface appears to be charred. Crabapple concentration is
intermixed with wood logs.

Depositional context Surface charred & mounded (soft material,
what H. on soil), as if dug up & redeposited; some pieces of
dead saplings were in feature i.e. 2-3 dead brushlets stacked
Condition and nature of disturbance into a pile)
S. above

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 2 Date: 7/8/83

Recorders: SL

Shot # (s) 175 (at center)

Dimensions in cm: L 208 X W 170

Firecracked rock: 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a slightly mounded dump. See sketch & tally below.

Depositional context E slope. wide terrace - mostly 15-20 m in diameter. Silty soil. Not within 10 m of 10. 2 m N of ephemeral cap lined drainage.

Condition and nature of disturbance None of note. Possible downhill movement in a short cut off.

Drawn? yes no ✓ (Label shot #s on drawing)

- 8 12 oz. Sanitary can
- 20 oz.
- 4 pop top alum. 5 ft. stick
- 4 med. size Sanitary can
- 3 condensed milk cans
- 1 dish soap bottle
- 2 alum pop l can 20 oz
- Sard. can.
- 1 salad oil bottle.

Feature Form

Sample Unit: 24 Date: 8/4/83

Recorders: AGH

Shot #(s) D-109

Dimensions in cm: L 12m X W 12m

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of a widely dispersed scatter of fire-cracked quartzite. 11 pieces present. Chert and quartzite flakes also scattered across this feature.

Depositional context *Eroding from sand dune (side of). Depth unknown.*

Condition and nature of disturbance *None outside of weathering and no walking over it*

Drawn? yes ☐ no ☒ (Label shot #(s) on drawing)

Feature Form

Sample Unit: 25 Date: 8-10-83

Recorders: SRM

Shot # (s) 83 thru 85

Dimensions in cm: L 1 M N-S X W 1 M E-W

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

3 nested firecracked + fire blackened quartzite cobbles w/ 4 fractured cobbles scattered. Most significant is the nested cobbles rest in carbon stained soil & other cobbles are present below them. The likelihood of intact subsurface deposits is strong. This appears to be exposed surface of a hearth. This concentration appears in an area of the unit where surface FCR is frequent. Quartzite primary flakes nearby. Hearth may be considerably larger than surface indication.

Depositional context gentle E slope of long sloping ridge slope. Small windward dunes above & below feature.

Condition and nature of disturbance more deposition appears to be occurring than deflation. Some sheetwash.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 25 Date: 8-10-83

Recorders: SPM

Shot # (s) 54 thru 58

Dimensions in cm: L 5M - N-S x W 2M E-W

Firecracked rock: X 0-25 pieces present
_____ 25-50 " "
_____ 50-100 " "
_____ 100+ " "

Description (include material, type, tentative interpretation):

13 fire-reddened + fire cracked quartzite cobbles are exposed along moderate NE slope. Very diffuse + scattered - most pieces exposed by some type of disturbance + the better part of the feature is most likely still buried. Very large cobbles (unburned + non-fractured) lie on the surface + just below w/in this area. Quartzite + chert flakes are present. This appears to be a badly disturbed hearth of merely scattered surface pieces of a predominantly buried hearth. Good deposition. No charcoal staining.

Depositional context silty sand NE slope just below steeper ridge slope.

Condition and nature of disturbance wind deflation & aggradation. Sheetwash erosion. Some shallow digging w/in feature boundaries, very likely by rodents.

Drawn? yes _____ no X (Label shot #s on drawing)

Feature Form

Sample Unit: 25 Date: 8-10-83

Recorders: SRM

Shot (s) 49 (1m radius around flag)

Dimensions in cm: L 2MN-5 x W 2ME-W

Firecracked rock: X 0-25 pieces present
 _____ 25-50 " "
 _____ 50-100 " "
 _____ 100+ " "

Description (include material, type, tentative interpretation):

14 pieces of fine reddened + fine cracked quartzite cobbles
 in fairly discrete concentration. No carbon, stained soil. No artifacts.
 Possible hearth remnant. Minor deflation appears to ^{have} exposed
 surface stones. Some integrity is likely subsurface if hearth is more
 densely "stoned" below the surface.

Depositional context Siltly sand - on very slight slope toward NE-LW side
 prominent ridge slopes that align E-W + slope off to NE. Good soil
 depth exists here.

Condition and nature of disturbance wind deflation w/ minimal
 sheet wash.

Drawn? yes no X (Label shot is on drawing)

Feature Form

Sample Unit: 25 Date: 8-10-89

Recorders: SRM

Shot # (s) 99 (1M N of 1M S of flag X 50cm E of 50cm W of flag)

Dimensions in cm: L 2M N-S x W 1M E-W

Firecracked rock: X 0-25 pieces present

<u>25-50</u>	"	"
<u>50-100</u>	"	"
<u>100+</u>	"	"

Description (include material, type, tentative interpretation):
19 pieces of fire cracked & fire reddened quartzite cobbles. No carbon staining. No immediate artifacts. Good soil deposition & likelihood of subsurface integrity is indicated by the number of pieces that are all but buried in overburden. Possible hearth or hearth remnant indicated.

Depositional context NE slope of ^{small} dunal deposit on moderate ^{NE} slope of top of ridge slope. Loose silty sand.

Condition and nature of disturbance alternate deflation & aggrading. Some minor sheetwash.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 25 Date: 8-11-83

Recorders: RM

Shot # (a) ^{E25} IN20E26, E27, E28; IN21E26, E27, E28, E29; IN22E28

Dimensions in cm: L 2M N-S X W 4ME-W

Firecracked rock: 0-25 pieces present

<u>X</u>	25-50	"	"
<u> </u>	50-100	"	"
<u> </u>	100+	"	"

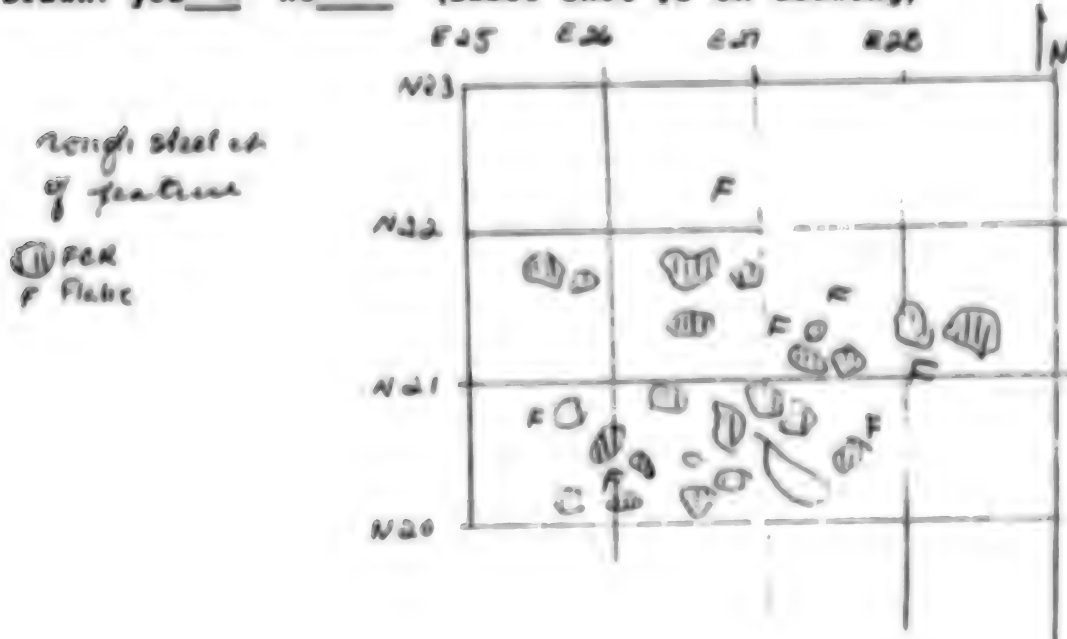
Description (include material, type, tentative interpretation):

~26 pieces of fine cracked & fine reddened quartzite cobbles w/ associated flakes of quartzite & chert. No carbon stained soil. Possible hearth. Sufficient deposition exists that some buried materials may occur although likely in disturbed context.

Depositional context deflating dunal deposit on gentle east slope of long ridge slope.

Condition and nature of disturbance deflation & redeposition of silty sand deposit 5 cm max. materials to be buried & exposed. Some minor sheetwash.

Drawn? yes no (Label shot #s on drawing)



Feature Form

Sample Unit: 25 Date: 6/14/93

Recorders: LL

Shot # (a) 144-147

Dimensions in cm: L 20 X W 50

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 "
☐ 50-100 "
☐ 100+ "

Description (include material, type, tentative interpretation):

Feature consists of approx 10 articles scattered & primarily over a discrete area. Articles are whole, oxidized, granular & large (15-40 cm). No other items seen in vicinity.

Depositional context Feature is located on a SE slope.

Condition and nature of disturbance None apparent.

Drawn? yes ☒ no ☐ (Label shot #s on drawing) 3 back



Approx.
Scale: 1 cm = 10 m

(... 1st ...
ing.)



Feature Form

Sample Unit: 25 Date: 8/11/92

Recorders: SLG

Shot # (s) 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51

Dimensions in cm: L 200 X W 82

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

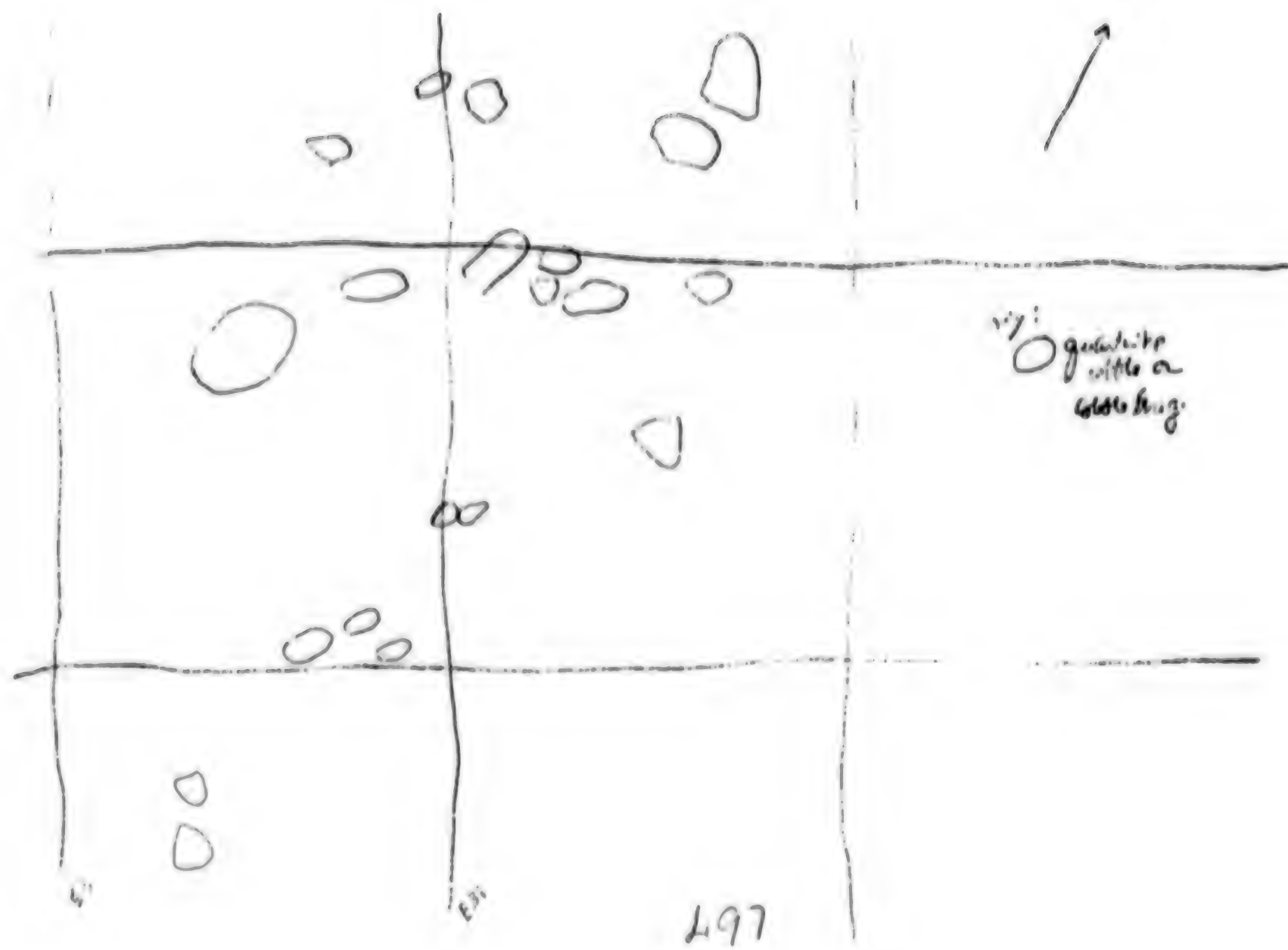
Description (include material, type, tentative interpretation):

Not a Thompson shell. It is a lead bullet of gaudy style. No staining or paint and no striations were found on surface.

Depositional context *Top of dune. Not particularly typical of dune.*

Condition and nature of disturbance *None. It is in good condition.*

Drawn? yes ☒ no ☐ (Label shot #s on drawing) *See back*



Feature Form

Sample Unit: 25 Date: 8-1-89

Recorders: SPM

Shot # (s) ^{E33} 1N10E34, E35, F36; 1N11E34, E35; 1N12E34, E35; 1N13E34, E35

Dimensions in cm: L 4m N-S X W 2M-E-W

Firecracked rock: 0-25 pieces present

X 25-50 " "
 _____ 50-100 " "
 _____ 100+ " "

Description (include material, type, tentative interpretation):

fine crushed & fine reddened quartzite cobbles and associated chert & quartzite flakes. Possible hearth remnant. No carbon stained soil. Good spatial context

Depositional context *in silty, dune deposit on E slope of long gentle easterly ridge slope.*

Condition and nature of disturbance *blow out w/in small dunes & large ant pile. Deflation & some redeposition of loose sand.*

Drawn? yes X no _____ (Label shot #s on drawing)

Sketch of feature

FCR

F Flake



Feature Form

Sample Unit: 25 Date: 9/11/93

Recorders: ELL

Shot # (s) 6041, N 2, 92 530.31

Dimensions in cm: L 220 X W 200

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

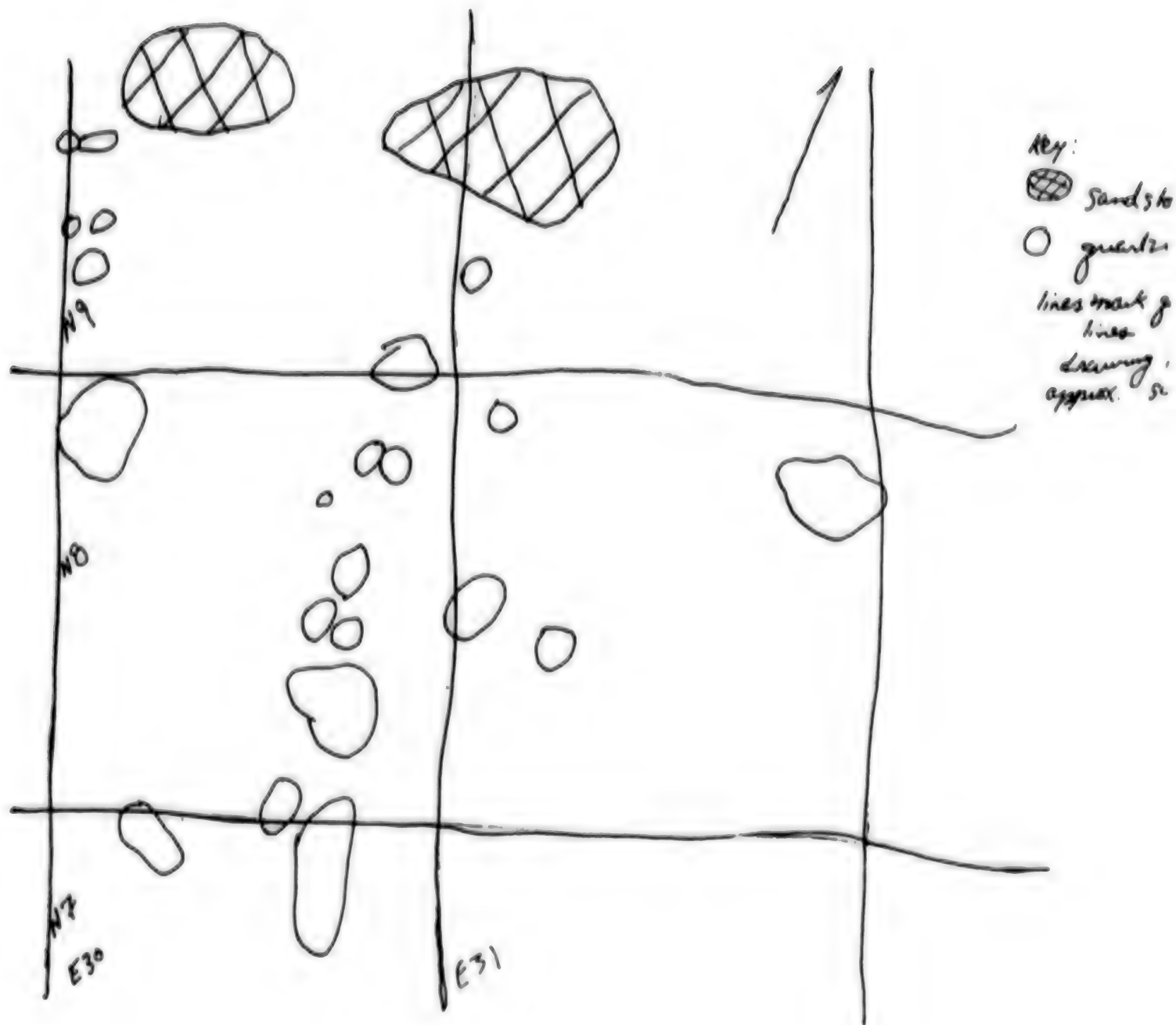
Description (include material, type, tentative interpretation):

Feature is a cluster of oriented & in a solid quartzite
rocks, irregularly distributed. No slabs or fragments
quartzite. It is similar to the feature. Two large sandstone
chunks are also present.

Depositional context Part of low flat dune; relatively bare
grassy area.

Condition and nature of disturbance Some FCR is visible in rock.

Drawn? yes ☒ no ☐ (Label shot #s on drawing) See back



500

BEST COPY AVAILABLE

500

Feature Form

Sample Unit: 25 Date: 5/11/95

Recorders: 44

Shot # (a) 119632 N 19022

Dimensions in cm: L 127 X W 107

Firecracked rock: 0-25 pieces present N18 E 23. 4 haps
✓ 25-50 " " N19 E 33. 7 haps
 50-100 " " N18 E 24 10 haps
 100+ " " N18 E 25 4 haps

Description (include material, type, tentative interpretation):

[illegible]

Condition and nature of disturbance *moderate*

Drawn? yes no X (Label shot is on drawing)

Feature Form

Sample Unit: 25 Date: 9/2/92

Recorders: SL

Shot #(s) 141-143

Dimensions in cm: L 2 m X W 1 m

Firecracked rock: ☐ 0-25 pieces present
☒ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

Feature is a horizontal cluster of a large number of
granite nodules. A large separation between the nodules
of the bed is 20 cm. No disturbance.
No staining is present, and no nodules were seen.

Depositional context: *Feature is located at 5 m from the base of the dune.*

Condition and nature of disturbance: *Feature is located at 5 m from the base of the dune.*

Drawn? yes ☒ no ☐ (Label shot #(s) on drawing) *See sketch.*

x R141

503

R1424

R1432

503

Feature Form

Sample Unit: 26 Date: 8/2/83

Recorder: S.L.L.

Shot # (s) 144-152

Dimensions in cm: L 4 m (13.1) X W 2 m (6.6)

Firecracked rock: ☒ 0-25 pieces present
☐ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

*Feature is a small (10 x 10) area of disturbed soil
with a few small rocks. It is located in a
flat area of the site. There are no other features here.*

Depositional context *disturbed soil sand. 100% as per 10/1/83
field. Feature is a small area of disturbed soil.*

Condition and nature of disturbance *disturbed soil*

Drawn? yes ☐ no ☐ (Label shot #s on drawing)

Feature Form

Sample Unit: 25 Date: 4-10-92

Recorder: CM

Shot # (s) 157

Dimensions in cm: L 45 X W 25

Firecracked rock: 25 0-25 pieces present
 25-50 " " "
 50-100 " " "
 100+ " " "

Description (include material, type, tentative interpretation):

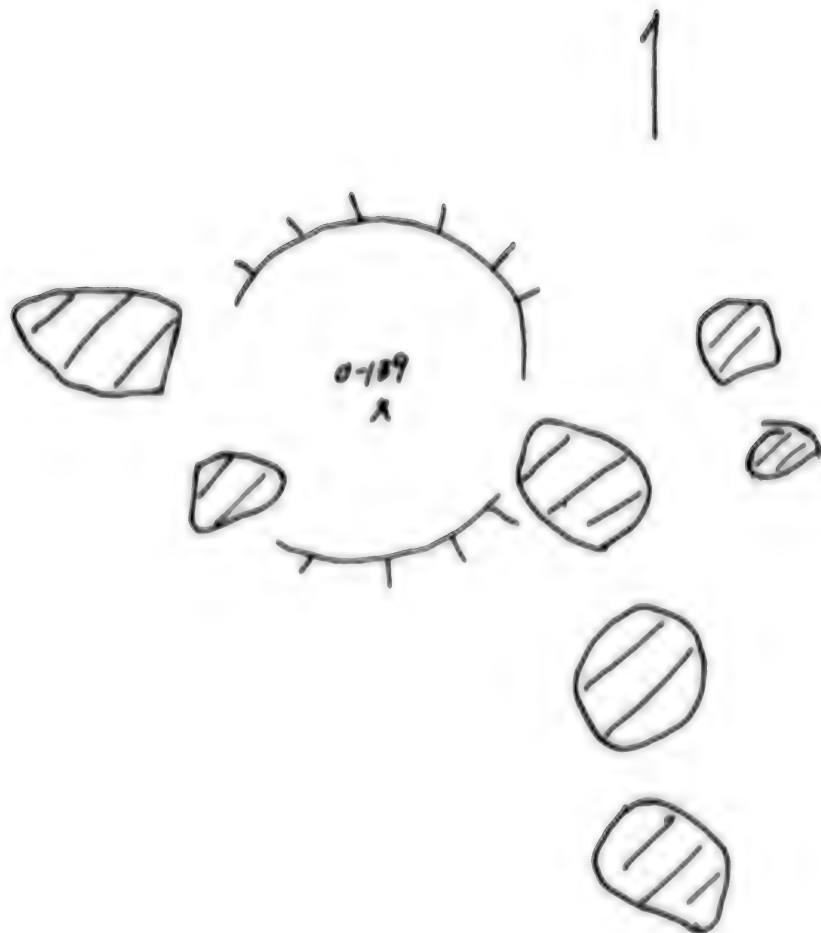
Feature is a small cluster of 10-15 small, dark, angular fragments of rock, possibly quartzite, embedded in a matrix of fine-grained sandstone. The fragments are generally 1-2 cm in size and are oriented in various directions. The matrix is a light-colored, fine-grained sandstone with a slightly wavy bedding.

Depositional context *Feature is located in a sandstone bed, approximately 10 cm above the base of the bed.*

Condition and nature of disturbance

1 disturbance: 10-15 small, dark, angular fragments of rock, possibly quartzite, embedded in a matrix of fine-grained sandstone.

Drawn? yes no (Label shot #s on drawing)



Scale: approx 1cm = 10cm

Key:  FCR

 hummock
of sand +
grasses

Feature Form

Sample Unit: 25 Date: 5/10/93

Recorders: S&L

Shot # (s) 189-191

Dimensions in cm: L est 15 m X W 10 m

Firecracked rock: 0-25 pieces present
✓ 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of an ashy surface covered with
 fragmented quartzite cobbles. Most pieces are nearly
 whole or large angular shunks. No concentrations
 are present. Nor is any staining. This feature
 appears to be related with (dense concentration)
 of holes on the lower top. Sparse holes overlie the feature.

Depositional context middle terrace at edge of
bedrock scarp.

Condition and nature of disturbance none apparent -
possible degradation of shot hole.

Drawn? yes no ✓ (Label shot #s on drawing)

no drawing.

Feature Form

Sample Unit: 26 Date: 7/9/83

Recorders: SLC/AGH

Shot # (s) 133 (at center)

Dimensions in cm: L 8 X W 11

Firecracked rock: ☒ 0-25 pieces present
☒ 25-50 " "
☒ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

*wood p. & remnants from probable sheepherders camp.
approx. 100 top of split wood present.*

Depositional context *gravelly terrace top*

Condition and nature of disturbance *None apparent*

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 26 Date: 7/9/83

Recorders: SLU/AGH

Shot # (s) 144

Dimensions in cm: L 3 x W 2

Firecracked rock:

<u> </u>	0-25 pieces present
<u> </u>	25-50 " "
<u> </u>	50-100 " "
<u> </u>	100+ " "

Description (include material, type, tentative interpretation):

*Sparse wood scatter, split logs or split lumber frags,
ca. 10 pieces present.*

Depositional context *top of gravelly terrace gently sloping E;
silty brown soil.*

Condition and nature of disturbance *now obvious*

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 20 Date: 7/9/83

Recorders: SLL/AGH

Shot # (s) 1-13

Dimensions in cm: L See below X W _____

Firecracked rock: _____ 0-25 pieces present
_____ 25-50 " "
_____ 50-100 " "
_____ 100+ " "

Description (include material, type, tentative interpretation):

Shot #s 1-3 mark E edge of sample unit + W edge of wood pile (wood frag. scatter). Feature continues W to edge of furnace (ca. 15 m), along with a scatter of tile cans + a glove bag. This area is outside the sample unit. Approx. 10-15 other unmarked artifacts are present.

Depositional context

Trench top, gravelly w/ lt brown silty soil

Condition and nature of disturbance Weathering - no other obvious disturbance

Drawn? yes _____ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 26 Date: 7/1/83

Recorders: SLL/AGH

Shot #s) 330 (N end), 330 (W end), 316 (S end), 324 (E end)

Dimensions in cm: L ca. 4 m N-S X W 4 m E-W

Firecracked rock: 0-25 pieces present

<u>25-50</u>	"	"
<u>50-100</u>	"	"
<u>100+</u>	"	"

Description (include material, type, tentative interpretation):

Feature is a primary reduction area with numerous large granite pebbles, some broken into chunks (naturally or culturally? uncertain). Numerous tested pebbles & pieces of shatter are also present & were not coded - only flakes coded. Most are concentrated in above area. Material is coarse-grained gray granite.

Depositional context S slope of low E trending ridge. Pebbles on surface are slightly buried. Soil is 4" brown fine silt.

Condition and nature of disturbance above Brins

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8-2-85

Recorders: SRM

Shot # (s) 588

Dimensions in cm: L 3M E-W x W 2MN-S

Firecracked rock: 0-25 pieces present
 25-50 " "
X 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

fairly well defined scatter of firecracked & reddened Archaic sandstone fragments. No carbon stained soil. Good amount of larger pieces which helps to define the concentration. Many small pieces also present. Remains of probable hearth. Little surface integrity but some subsurface may remain. Historic rubber shoe soles w/in 2m.

Depositional context *silty sand flats above & east of existing playa. Some very shallow dunes w/in 25m of feature*

Condition and nature of disturbance *disturbance between greasewood & sage clumps, also general erosion/deposition from sheetwash.*

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8-2-83

Recorders: SRM

Shot # (s) 569-572

Dimensions in cm: L 14m N-S X W 4m E-W

Firecracked rock: 0-25 pieces present
 25-50 " "
X 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):
very diffuse scatter of fire cracked, reddened + bleached local sandstone fragments & fire cracked quartzite cobbles. No carbon stained soil. Possibly very disturbed hearth. Context exists solely through the relative concentration of the materials. Sandstone frags are predominant representing at least 90% of the feature. Feature has little or no integrity. Other small FCR fragments are sparsely scattered in this area.

Depositional context north slope of steep dune - silty sand - scatter now rests on hard surface of contact w/ old playa?

Condition and nature of disturbance dune edge is being sharply eroded by sheet wash, wind & minor gully wash. FCR is being carried downslope diffusely toward the north.

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8-2-83

Recorders: SRM

Shot # (s) 579 thru 582

Dimensions in cm: L 4M N-S X W 3M E-W

Firecracked rock: X 0-25 pieces present
 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

very diffuse scatter of 10 pieces of fine reddened local sandstone. no carbon staining & no context beyond the spatial relationships of the fragments. pieces vary from ~ 8cm dia to 1cm dia. Possible remnants of breccia but no integrity remains.

Depositional context steep north face of dune - silty sand. FCR lie on hard surface of interface w/ o/a playa?

Condition and nature of disturbance Sheetwash & wind erosion have distributed the FCR downlope to the north. Other small frags are scattered sparsely in this area.

Drawn? yes no (Label shot #s on drawing)

Feature Form

Sample Unit: 2B Date: 8-2-83

Recorders: SRM

Shot # (s) 0537

Dimensions in cm: L 1.5m E-W X W .75m N-S

Firecracked rock: 0-25 pieces present
Y 25-50 "
50-100 "
100+ "

Description (include material, type, tentative interpretation):
fire fractured, reddened + blackened local sandstone. Most are small fragments less than 2 cm dia. but 5 fragments are ~ 6 cm dia. no carbon stained void. Remains of possible hearth show little integrity beyond proximity of the fragments.

Depositional context exposed in small deflated area of shallow sand deposit. Soil is silty sand.

Condition and nature of disturbance none & very minor sheetwash

Drawn? yes no X (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 7/28/83

Recorders: AGM

Shot # (s) 0-29

Dimensions in cm: L 3m X W 3m

Firecracked rock: 0-25 pieces present
 25-50 " "
✓ 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of lightly scattered fer (sandstone and quartzite) over an area 3 m in diam. At the E edge of the scatter is a dense concentration of fer covering 75 cm x 25 cm. No ash or charcoal present.

Depositional context

Surface stones half buried

Condition and nature of disturbance

Located in sand dune. Subsurface material is probable

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8/11

Recorder: SL

Shot # (s) 976

Dimensions in cm: L 200 X W 75

Firecracked rock:

<u> </u>	0-25 pieces present	
<u> </u>	25-50 "	"
<u>✓</u>	50-100 "	"
<u> </u>	100+ "	"

Description (include material, type, tentative interpretation):

Feature is a predominantly sandstone scatter of small rock frags, amorphous in configuration. No stain is present. Most pieces are 1-4 cm. in long th.

Depositional context Small blowout on E side of low dune.

Condition and nature of disturbance Disturbance from dune.

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8/2/83

Recorders: SLL

Shot # (s) 779, 201, 202, 347, 399

Dimensions in cm: L 590 X W 590

Firecracked rock: 0-25 pieces present

✓ 25-50 " "
 50-100 " "
 100+ " "

Description (include material, type, tentative interpretation):

Feature consists of an amorphous scatter of oxidized sedimentary rock (possibly with cemented sandstone) of sizes ranging from 1.5 cm bgs to 10-15 cm bgs. No staining is present. A small % of tiny quartzite bgs is interspersed. Feature borders on a 2nd feature consisting predominantly of gls rubble (see loc 10m) but there seems to be a definable border based on differences in material between the two.

Depositional context Midspan Howcut sloping N to playa from edge of dune.

Condition and nature of disturbance Shallow, = deflation of feature - unsure of original location or configuration.

Drawn? yes no ✓ (Label shot #s on drawing)

Feature Form

Sample Unit: 2B Date: 8/2/83

Recorders: SLC

Shot # (s) 981

Dimensions in cm: L 100 X W 100

Firecracked rock:

	0-25 pieces present
☒	25-50 "
☐	50-100 "
☐	100+ "

Description (include material, type, tentative interpretation):

Feature is a concentration of quartzite rubble top ranging in size from 1 cm to 7 cm. No staining is present.

Depositional context *blowout at E base of low dune*

Condition and nature of disturbance *probably deflation & sheet wash.*

Drawn? yes ☐ no ☒ (Label shot #s on drawing)

Feature Form

Sample Unit: 28 Date: 8/2/83

Recorders: Garry

Shot # (s) 387 - 388 - 389 - 390 (799-901-902 over lap)

Dimensions in cm: L 6 m 300m (EW) x W 6 m 50m (NS) ^{with sandstone} _{CR area}

Firecracked rock: 0-25 pieces present
☒ 25-50 " "
☐ 50-100 " "
☐ 100+ " "

Description (include material, type, tentative interpretation):

This is a large scatter of FCR with an area of concentration in the NE corner. The rock is largely of granite with sandstone from what is considered the over lap of the working feature to the east

Depositional context

desert pan with cobbled stone surface and hard packed caliche soil

Condition and nature of disturbance

FCR is located in a blow out area, alongside a sand dune to the south and plays to the north - actually it is on the edge of the plays

Drawn? yes ☐ no ☒ (Label shot # on drawing)

APPENDIX VII
Photo Logs

**Photo Log
Seedsakadee Project**

Roll # 1

Circle: B/W Film type PX 135
Color

Date	Initials	Exp/No.	Description *	View to:
7-8-83	SLL	1 2A	1-8; point midsection	NA
7-11-83	SLL	2 3A	21-115; corner notched point	NA
7-11-83	SLL	3 4A	21-118; stemmed concave base point	NA
7-13-83	SLL	4 5A	8-296; stemmed corner notch point	NA
7-13-83	SLL	5 6A	8-353; large corner notch point base fragment	NA
7-14-83	LAW	6 7A	7-37; point midsection	NA
7-14-83	LAW	7 8A	7-38; tool fragment	NA
7-14-83	LAW	8 9A	7-36; notched obsidian point	NA
7-14-83	LAW	9 10A	7-8; point fragment	NA
7-19-83	SKM	10 11A	8-1N0E4 & 8-613; projectile pts.	NA
7-19-83	SKM	11 12A	8-2N4E3 & 8-2N5E5; projectile point and fragment	NA
7-19-83	SLL	12 13A	8-654; small stemmed projectile point, tip missing	NA
7-20-83	LAW	13 14A	15-356; small projectile point, tip and base damaged	NA
7-21-83	SLL	14 15A	8-787 & 8-10N11E7; projectile pts.	NA
7-21-83	SLL	15 16A	8-11N2E27; projectile point	NA
7-21-83	SLL	16 17A	8-4N6E16, 4N6E12, 4N6E11; projectile points	NA
7-21-83	SLL	17 18A	8-695; feature (oxidized cobbles)	North
7-21-83	SLL	18 19A	8-695; feature (oxidized cobbles)	East
7-21-83	SLL	19 20A	8-745; large projectile point	NA
7-22-83	LAW	20 21A	2-1; projectile point fragment	NA
7-22-83	DDM	21 22A	2-40; projectile point base	NA
7-22-83	DDM	22 23A	2-41; projectile point	NA
7-22-83	SLL	23 24A	2-80; projectile point base	NA
7-23-83	AGH	24 25A	3-50; projectile point base	NA
7-23-83	AGH	25 26A	3-50; projectile point base	NA
7-24-83	SLL	26 27A	5-15; unnotched projectile point	NA
7-24-83	SLL	27 28A	5-15; unnotched projectile point	NA
7-27-83	LAW	28 29A	22; feature 2 (lithic scatter)	NA
7-27-83	LAW	29 30A	22; feature 1 (fire-cracked rock)	NA
7-27-83	LAW	30 31A	Fontenelle Camp	East
7-27-83	LAW	31 32A	Fontenelle Camp	East
7-27-83	LAW	32 33A	Fontenelle Camp	East
7-28-83	DDM	33 34A	6-192; knife/projectile point	NA

* Description is of form: Unit number-Shot number, brief description

Photo Log
SeedsKadee Project

Roll # 1

Circle: B/W Film type PX 135
Color

[illegible]

* Description is of form: Unit number-Shot number; orief description

Photo Log SeedsKadee Project

Roll # 2

Circle: B/W Film type PX 135
Color

[illegible]

Description is of form: Unit number-Shot number; brief description

APPENDIX VIII
Catalogue of Collected Artifacts

Seedsakadee Cultural Resources Assessment Project
Catalog of Collected Artifacts

Unit	Provenience	Description
4	18	projectile point midsection
	77	projectile point tip
	285	projectile point
	290	projectile point
	1N7E34	projectile point
	1N13E25	projectile point
	4AN9F8	tool fragment
	4BN9F10	projectile point
10	43	projectile point
	116	projectile point
	215	projectile point
	340	projectile point
	475	projectile point
	502	projectile point
	605	projectile point midsection
	723	projectile point
	733	projectile point
	1N10E8	projectile point
16	71	projectile point (tip missing)
17	14	projectile point
	248	projectile point
	255	projectile point
	261	projectile point
	280	projectile point
19	39	reworked projectile point
	5N25E12	projectile point
20	17	flake
	19	flake
	20	projectile point fragment
	21	flake
	50	projectile point fragment
24	4	projectile point
25	153	projectile point
	417	projectile point
	1114F16	projectile point base
28	77	projectile point
	174	tool

199	projectile point base
275	projectile point midsection
276	projectile point
284	projectile point
370	projectile point
373	projectile point
649	projectile point
663	projectile point
741	projectile point (base missing)
751	projectile point
764	projectile point base
805	projectile point base
809	projectile point base
810	projectile point base
845	projectile point
859	projectile point
9N1E4	projectile point
9N1E6	projectile point

BLANK PAGE

APPENDIX IX
University of New Mexico Computer Analysis Programs

lcs ejob

READY

4

NAME: SJOB

CONTENT: DATA

LENGTH: 526 CHARS, 11 LINES

HIGHEST LINE NUMBER: 110

118

```
10 //SAS EXEC SAS
20 //SYSPRINT DD SYSOUT=*
30 //TRANS DD DSN=USER.T75903.SASCRAPE.TRANS,DISP=OLD
40 //STONE DD DSN=USER.T75903.SASCRAPE.STONE,DISP=OLD
50 //GRID6 DD DSN=USER.T75903.SASCRAPE.GRID6,DISP=OLD
60 //HISTO DD DSN=USER.T75903.SASCRAPE.HISTO,DISP=OLD
70 //SCRAP DD DSN=USER.T75903.SASCRAPE.SCRAP,DISP=OLD
80 //DISCV DD DSN=USER.T75903.SASCRAPE.DISCV,DISP=OLD
90 //SCRATCH DD DSN=USER.T75903.SASCRAPE.SCRATCH,DISP=OLD
100 //SASLIB DD DSN=USER.T75903.SASCRAPE.FORMATS,DISP=OLD
110 //SYSIN DD *
```

```

100 ginput
READY
q
NAME: GINPUT
CONTENT: DATA
LENGTH: 1648 CHARS, 56 LINES
HIGHEST LINE NUMBER: 560
110
10 MACRO STOUP
20 DATA GRIDS, SNAME (LABEL=UNIT UNUM, GRIDS, 10-83);
30 LENGTH DEFAULT=2;
40 LENGTH V2 4 V4 8 V5 8 V6 8 V28 8 V29 8 V30 8 V32 8 V34 4 V35 4;
50 INPUT V34 1-2 V35 4-5 V1 8 6 V3 7-8 V4 10-12 V5 14-16
60      V6 18-20 V7 22      V8 23      V9 31-32 V10 34
70      V11 35      V12 36      V13 38      V14 39      V15 40
80      V16 41      V17 42      V18 43      V19 44      V20 45
90      V21 47-48 V22 50      V23 51-52 V24 54      V25 55
100     V26 56-57 V27 58      V28 60-62 V29 64-66 V30 68-70 0;
110     IF V9=60 OR V9=61 THEN INPUT V31 25-29;
120     ELSE INPUT V32 25-29;
130 LABEL V1=FLAG
140     V2-ID NUMBER
150     V3=MATERIAL
160     V4=LENGTH
170     V5=WIDTH
180     V6=THICKNESS
190     V7=COMPLETENESS
200     V8=ILLUSTRATION
210     V9=TYPE
220     V10=CORTICAL COVERING
230     V11=DORSAL SCAR COUNT
240     V12=PLATFORM CHARACTERISTIC
250     V13=BREAKAGE
260     V14=MODIFICATION
270     V15=LOCATION OF MOD.
280     V16=EDGE SHAPE
290     V17=EDGE ANGLE (ORIGINAL)
300     V18=MOD. EDGE ANGLE
310     V19=PERC. EDGE MODIFICATION
320     V20=PERC. SURFACE MODIFICATION
330     V21=FORMAL TOOL TYPE
340     V22=TEXT
350     V23=GR ST TYPE
360     V24=PREPARATION
370     V25=WORN SURFACES
380     V26=CROSS-SECTION
390     V27=WEAR
400     V28=INT LENGTH
410     V29=INT WIDTH
420     V30=INT THICKNESS
430     V31=# FOR FRAGS
440     V32=WEIGHT

```

450 V33=CODER
460 V34=NORTHING
470 V35=EASTING
480 V36=GRID NUMBER;
490 V33=CIN;
500 V36=GNUM;
510 CARDS;
520 ?
530 MACRO SNAME 82 ?
540 MACRO CIN 1 ?
550 MACRO GNUM 1 ?
560 STOUP

100 input

READY

q

NAME: INPUT

CONTENT: DATA

LENGTH: 1565 CHARS, 52 LINES

HIGHEST LINE NUMBER: 520

110

10 MACRO STOUP

20 DATA STONE.SNAME (LABEL=UNIT UNUM, CH=GR STONE, 10-83);

30 LENGTH DEFAULT=2;

40 LENGTH V2 4 V4 8 V5 8 V6 8 V28 8 V29 8 V30 8 V32 8 V34 4 V35 4;

50 INPUT V34 1-2 V35 4-5 V1 8 6 V3 7-8 V4 10-12 V5 14-16

60 V6 18-20 V7 22 V8 23 V9 31-32 V10 34

70 V11 35 V12 36 V13 38 V14 39 V15 40

80 V16 41 V17 42 V18 43 V19 44 V20 45

90 V21 47-48 V22 50 V23 51-52 V24 54 V25 55

100 V26 56-57 V27 58 V28 60-62 V29 64-66 V30 68-70 0;

110 IF V9=60 OR V9=61 THEN INPUT V31 25-29;

120 ELSE INPUT V32 25-29;

130 LABEL V1=FLAG

140 V2=ID NUMBER

150 V3=MATERIAL

160 V4=LENGTH

170 V5=WIDTH

180 V6=THICKNESS

190 V7=COMPLETENESS

200 V8=ILLUSTRATION

210 V9=TYPE

220 V10=CORTICAL COVERING

230 V11=DORSAL SCAR COUNT

240 V12=PLATFORM CHARACTERISTIC

250 V13=BREAKAGE

260 V14=MODIFICATION

270 V15=LOCATION OF MOD.

280 V16=EDGE SHAPE

290 V17=EDGE ANGLE (ORIGINAL)

300 V18=MOD. EDGE ANGLE

310 V19=PERC. EDGE MODIFICATION

320 V20=PERC. SURFACE MODIFICATION

330 V21=FORMAL TOOL TYPE

340 V22=TEXT

350 V23=GR ST TYPE

360 V24=PREPARATION

370 V25=WORN SURFACES

380 V26=CROSS-SECTION

390 V27=WEAR

400 V28=INT LENGTH

410 V29=INT WIDTH

420 V30=INT THICKNESS

430 V31=# FOR FRAGS

440 V32=WEIGHT

450 V33-CODER;
460 V33-CIN;
470 CARDS;
480 I
490 MACRO SNAME 81 I
500 MACRO UNUM 1 I
510 MACRO CIN 1 I
520 STOUP


```

9
NAME: MERGE
CONTENT: DATA
LENGTH: 1415 CHARS, 58 LINES
HIGHEST LINE NUMBER: 580
110
10 MACRO TOG
20 DATA ONE EIGHT:
30     LENGTH V1 $ 1 V2 5 V37 8 V38 8 V39 8 V40 $ 5 V42 2 V43 $ 1;
40     SET TRANS.RNAME
50 IF P NE 'G' THEN GO TO HERE;
60 CHECK=SUBSTR(ID,2,2);
70 IF CHECK NE 'NW' AND CHECK NE 'SW' AND CHECK NE 'NE' AND CHECK NE 'SE'
80 THEN P='O';
90 HERE: V1=P;
100 V2=NUM;
110 V37=X;
120 V38=Y;
130 V39=Z;
140 V40=ID;
150 V42=UNUM;
160 LABEL V37=X-AXIS LOCATION
170     V38=Y-AXIS LOCATION
180     V39=Z-AXIS LOCATION
190     V40=IDENTIFICATION
200     V42=UNIT NUMBER
210     V43=IDENT. CODE;
220 V43=V1;
230 IF V1='C' or V1='S' or V1='G' THEN OUTPUT EIGHT;
240 OUTPUT ONE;
250 KEEP V1 V2 V37 V38 V39 V40 V42;
260 DATA TWO;
270     SET HISTO.HNAME;
280 DATA THREE;
290     SET STONE.SNAME;
300 PROC SORT DATA=ONE; BY V2;
310 PROC SORT DATA=TWO; BY V2;
320 PROC SORT DATA=THREE; BY V2;
330 DATA FIVE;
340     MERGE ONE (IN=INO)
350         TWO (IN=INT);
360 BY V2;
370 IF INO AND INT;
380 IF V43='G' THEN V43='T';
390 DATA SIX;
400     MERGE ONE (IN=INO)
410         THREE (IN=INT);
420 BY V2;
430 IF INO AND INT;
440 IF V1='S' THEN V43='S';
450 IF V1='G' THEN V43='G';
460 IF V1='C' THEN V43='C';
470 IF V1='O' OR V1='R' THEN V43='L';

```

```
480 DATA SCRAP.UNAME (LABEL=SCRAP, UNIT UNUM, 1-84);
490 SET EIGHT FIVE SIX;
500 KEEP V1-V33 V37-V40 V42-V43;
510 %
520 MACRO RNAME R7%
530 MACRO UNUM 7 %
540 MACRO SNAME S7 %
550 MACRO HNAME H7 %
560 MACRO UNAME U7 %
570 TOG
580 //
```

```

100 reduce
READY
9
NAME: REDUCE
CONTENT: DATA
LENGTH: 1455 CHARS, 62 LINES
HIGHEST LINE NUMBER: 620
110
10 MACRO REDUCE
20 DATA NAUGHT;
30   LENGTH N 4;
40   SET TRANS.FNAME;
50   N= N ;
60   ORDER='C';
70   IF ID='SW' THEN ORDER='A';
80   IF ID='NW' THEN ORDER='B';
90 PROC SORT; BY ORDER;
100 DATA ONE;
110   SET NAUGHT;
120   PI=3.141592654;
130   HRAD=(HD+(HM/60)+(HS/3600))*PI/180;
140   VRAD=(VD-90+(VM/60)+(VS/3600))*PI/180;
150   R=DIST*COS(VRAD);
160   X=R*SIN(HRAD);
170   Y=R*COS(HRAD);
180   ORDER='C';
190   IF ID NE 'SW' and ID NE 'NW' THEN RETURN;
200   IF ID='NW' THEN GO TO F1;
210   H1=HRAD;
220   R1=R;
230   X1=X;
240   Y1=Y;
250   RETAIN H1 R1 X1 Y1;
260   ORDER='B';
270 RETURN;
280 F1: H2=HRAD;
290   R2=R;
300   ORDER='A';
310   Y2=Y;
320   X2=X;
330 PROC SORT; BY ORDER;
340 DATA TRANS.RNAME;
350   SET ONE;
360   LABEL X=EASTING Y=NORTHING Z=ELEVATION;
370   IF ID NE 'NW' THEN GO TO F2;
380   EDGE=SQRT((X1-X2)**2+(Y1-Y2)**2);
390   XTRANS1=0-X1;
400   YTRANS1=0-Y1;
410   XP2=X2+XTRANS1;
420   YP2=Y2+YTRANS1;
430   XPP2=0;
440   YPP2=EDGE;

```

```

450      MESS=(XP2*XP2)+(YP2*YP2);
460      DMESS=(XP2*XP2)+(YP2*YP2);
470      AMESS=MESS/DMESS;
480      THETA=ARCCOS(AMESS)*(-1);
490      RETAIN THETA XTRANS1 YTRANS1;
500 F2:  A=X+XTRANS1;
510      B=Y+YTRANS1;
520      XP=(A*COS(THETA))-(B*SIN(THETA));
530      YP=(A*SIN(THETA))+(B*COS(THETA));
540      X=XP+100;
550      Y=YP+100;
560      Z=100+HI-PH-R*SIN(VRAD);
570      KEEP X Y Z N ID F NUM;
580      %
590      MACRO FNAME T1A %
600      MACRO RNAME R1 %
610      REDUCE
620      //

```

9
 NAME: TRANSUP
 CONTENT: DATA
 LENGTH: 1630 CHARS, 52 LINES
 HIGHEST LINE NUMBER: 520

```

lis
10 MACRO TRANSUP
20 DATA TRANS.TNAME (LABEL=UNIT UNUM, TRANSIT, 10-83);
30 INFILE CARDS:
40   LENGTH ID $ 5 F $ 1 NUM 3 DIST 8 HD 3 HM 2 HS 2 VD 2
50     VM 2 VS 2 PH 8 HI 8;
60   INPUT ID $ READING: $19. PH: 3.2 HI: 3.2;
70 LABEL F=FLAG
80   NUM=SHOT NUMBER
90   ID=FLAG AND SHOT NUMBER
100  DIST=DISTANCE
110  HD=HORIZONTAL ANGLE (DEGREES)
120  HM=HORIZONTAL ANGLE (MINUTES)
130  HS=HORIZONTAL ANGLE (SECONDS)
140  VD=VERTICAL ANGLE (DEGREES)
150  VM=VERTICAL ANGLE (MINUTES)
160  VS=VERTICAL ANGLE (SECONDS)
170  PH=PRISM HEIGHT
180  HI=HEIGHT OF INSTRUMENT;
190  V1=SUBSTR(READING,1,5);
200  V2=SUBSTR(READING,6,3);
210  V3=SUBSTR(READING,9,2);
220  V4=SUBSTR(READING,11,2);
230 IF LENGTH(READING) > 18 THEN GO TO HERE;
240  V5=SUBSTR(READING,13,2);
250  V6=SUBSTR(READING,15,2);
260  V7=SUBSTR(READING,17,2);
270 GO TO THERE;
280 HERE: V5=SUBSTR(READING,13,3);
290  V6=SUBSTR(READING,16,2);
300  V7=SUBSTR(READING,18,2);
310 THERE: CHECK=SUBSTR(ID,1,3);
320  PREF=SUBSTR(ID,1,1);
330  IF PREF='O' THEN F='O';
340  IF PREF='R' THEN F='R';
350  V8=SUBSTR(ID,2);
360  IF CHECK='STA' THEN F='S';
370  IF ID='SW' OR ID='NW' OR ID='NE' OR ID='SE' THEN F='C';
380  IF F NE 'O' AND F NE 'R' AND F NE 'C' AND F NE 'S' THEN F='G';
390  NUM=INPUT(V8,4.);
400  DIST=INPUT(V1,5.2);
410  HD=INPUT(V2,3.);
420  HM=INPUT(V3,2.);
430  HS=INPUT(V4,2.);
440  VD=INPUT(V5,3.);
450  VM=INPUT(V6,2.);
460  VS=INPUT(V7,2.);
  
```

470 KEEP ID F NUM DIST HD HM HS VD VM VS PH HI;
480 CARDS;
490 %
500 MACRO TNAME T1A %
510 MACRO UNUM 1 %
520 TRANSUP

APPENDIX X
Statistical Analysis Systems (SAS) Programs

1 S A S L O G OS SAS 82.3 V02/MVS JOB T1093218 STEP SAS
PROC SAS 14:54 SUNDAY, FEBRUARY 12, 1984

NOTE: THE JOB T1093218 HAS BEEN RUN UNDER RELEASE 82.3 OF SAS AT THE UNIVERSITY
OF NEW MEXICO (01403001).

NOTE: SAS OPTIONS SPECIFIED ARE:
 SORT=4

1 OPTIONS MISSING=' ' OBS=0;
2 DATA ONE;
3 SET DISCV.DCODES;

NOTE: DATA SET WORK.ONE HAS 0 OBSERVATIONS AND 8 VARIABLES. 1804 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.09 SECONDS AND 220K.

4 DATA TWO;
5 SET DISCV.D1 DISCV.D2 DISCV.D3
6 DISCV.D4 DISCV.D5 DISCV.D6
7 DISCV.D7 DISCV.D8 DISCV.D9
8 DISCV.D10 DISCV.D13 DISCV.D14 DISCV.D15
9 DISCV.D16 DISCV.D17 DISCV.D19
10 DISCV.D20 DISCV.D21 DISCV.D22 DISCV.D23
11 DISCV.D24 DISCV.D25 DISCV.D26 DISCV.D28
12 DISCV.D24E;

NOTE: DATA SET WORK.TWO HAS 0 OBSERVATIONS AND 10 VARIABLES. 998 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.45 SECONDS AND 223K.

13 PROC SORT DATA=ONE; BY UNIT;

NOTE: NO OBSERVATIONS TO BE SORTED.
NOTE: DATA SET WORK.ONE HAS 0 OBSERVATIONS AND 8 VARIABLES. 1804 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.07 SECONDS AND 384K.

14 PROC SORT DATA=TWO; BY UNIT;

NOTE: NO OBSERVATIONS TO BE SORTED.
NOTE: DATA SET WORK.TWO HAS 0 OBSERVATIONS AND 10 VARIABLES. 998 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.26 SECONDS AND 384K.

15 DATA THREE;
16 MERGE ONE(IN=INO)
17 TWO(IN=INT);
18 BY UNIT;
19 IF INT;
20 LABEL UNIT=UNIT NUMBER
21 SWEEP=SWEEP NUMBER
22 A1=ARTIFACT COUNT (POSITION 1)
23 A2=ARTIFACT COUNT (POSITION 2)
24 A3=ARTIFACT COUNT (POSITION 3)
25 A4=ARTIFACT COUNT (POSITION 4)
26 A5=ARTIFACT COUNT (POSITION 5)
27 BTIME=BEGIN TIME/SWEEP
28 ETIME=END TIME/SWEEP

2 S A S L O G 08 SAS 82.3 VS2/MVS JOB T1093218 STEP SAS
 PROC SAS 14:54 SUNDAY, FEBRUARY 12, 1984

```

29            DATE=DATE SURVEYED
30            P1=POSITION 1 PERSON
31            P2=POSITION 2 PERSON
32            P3=POSITION 3 PERSON
33            P4=POSITION 4 PERSON
34            P5=POSITION 5 PERSON
35            DIR=DIRECTION SURVEYED;
36        FILE PUNCH NOTITLES;
37        PUT @1     'D'
38            @2     UNIT        2.
39            @4     SWEEP       2.
40            @6     A1          3.
41            @9     A2          3.
42            @12    A3          3.
43            @15    A4          3.
44            @18    A5          3.
45            @21    BTIME TIMES.
46            @29    BTIME TIMES.
47            @37    DATE    DATE7.
48            @44    P1          1.
49            @45    P2          1.
50            @46    P3          1.
51            @47    P4          1.
52            @48    P5          1.
53            @49    DIR    CHAR2.

```

NOTE: 0 LINES WERE WRITTEN TO FILE PUNCH.

NOTE: DATA SET WORK.THREE HAS 0 OBSERVATIONS AND 17 VARIABLES, 700 OBS/TRK.

NOTE: THE DATA STATEMENT USED 0.27 SECONDS AND 220K.

NOTE: SAS INSTITUTE INC.

SAS CIRCLE

PO BOX 8000

CARY, N.C. 27511-8000

1 SAS LOG OS SAS 82.3 VB2/MVS JOB T1093224 STEP SAS
PROC SAS 01:02 TUESDAY, FEBRUARY 14, 1986

NOTE: THE JOB T1093224 HAS BEEN RUN UNDER RELEASE 82.3 OF SAS AT THE UNIVERSITY
OF NEW MEXICO (01403001).

NOTE SAS OPTIONS SPECIFIED ARE:
SORT=4

1 OPTIONS MISSING=' '
2 DATA ONE;
3 SET SCRAP.U10 SCRAP.U12 SCRAP.U13 SCRAP.U14 SCRAP.U15;

NOTE: DATA SET WORK.ONE HAS 1187 OBSERVATIONS AND 39 VARIABLES. 160 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.40 SECONDS AND 224K.

4 PROC SORT; BY V42 V2 V40;

NOTE DATA SET WORK.ONE HAS 1187 OBSERVATIONS AND 39 VARIABLES. 160 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.61 SECONDS AND 312K.

5 DATA TWO; SET ONE;
6 FILE PUNCH NOTITLES;
7 LABEL V1=FLAG
8 V2=IDENTIFICATION NUMBER
9 V3=MATERIAL TYPE
10 V4=LENGTH
11 V5=WIDTH
12 V6=THICKNESS
13 V7=COMPLETENESS
14 V8=ILLUSTRATION
15 V9=TYPE
16 V10=CORTICAL COVERING
17 V11=DORSAL SCAR COUNT
18 V12=PLATFORM CHARACTERISTIC
19 V13=BREAKAGE
20 V14=MODIFICATION
21 V15=LOCATION OF MOD.
22 V16=EDGE SHAPE
23 V17=EDGE ANGLE (ORIGINAL)
24 V18=EDGE ANGLE (MODIFIED)
25 V19=PERC. EDGE MODIFICATION
26 V20=PERC. SURFACE MODIFICATION
27 V21=FORMAL TOOL TYPE
28 V22=TEXT
29 V23=GR ST TYPE
30 V24=PREPARATION
31 V25=WORN SURFACES
32 V26=CROSS-SECTION
33 V27=WEAR
34 V28=INT LENGTH
35 V29=INT WIDTH
36 V30=INT THICKNESS
37 V31=# PCR FRAGS
38 V32=WEIGHT

2 S A S L O G O8 SAS 82.3 V52/MV8 JOB T1093224 STEP SAS
 PROC SAS 0:02 TUESDAY, FEBRAURY 14, 1984

39 V33=CODER
 40 V37=EASTING
 41 V38=NORTHING
 42 V39=ELEVATION
 43 V40=ID
 44 V42=UNIT NUMBER
 45 V43=BRIEF DESCRIPTION;

46 PUT @1 '8'
 47 @2 V42 2.
 48 @4 V40 CHAR5.
 49 @9 V37 6.2
 50 @15 V38 6.2
 51 @21 V39 6.2
 52 @27 V43 CHAR1.
 53 @28 V33 2.
 54 @30 V3 2.
 55 @32 V4 3.
 56 @35 V5 3.
 57 @38 V6 3.
 58 @41 V7 1.
 59 @42 V8 1.
 60 @43 V9 2.
 61 @45 V10 1.
 62 @46 V11 1.
 63 @47 V12 1.
 64 @48 V13 2.
 65 @50 V14 1.
 66 @51 V15 1.
 67 @52 V16 1.
 68 @53 V17 1.
 69 @54 V18 1.
 70 @55 V19 1.
 71 @56 V20 1.
 72 @57 V21 1.
 73 @58 V22 1.
 74 @59 V23 2.
 75 @61 V24 1.
 76 @62 V25 1.
 77 @63 V26 2.
 78 @65 V27 1.
 79 @66 V28 3.
 80 @69 V29 3.
 81 @72 V30 3. @;
 82 IF V9 >=60 THEN PUT @75 V31 5.;
 83 IF V9<60 THEN PUT @75 V32 5.1;

NOTE: 1187 LINES WERE WRITTEN TO FILE PUNCH.

NOTE: DATA SET WORK.TWO HAS 1187 OBSERVATIONS AND 39 VARIABLES. 160 OBS/TRK.

NOTE: THE DATA STATEMENT USED 1.22 SECONDS AND 220K.

NOTE: SAS USED 312K MEMORY.

NOTE: SAS INSTITUTE INC.
SAS CIRCLE
PO BOX 8000
CARY, N.C. 27511-8000

1 SAS LOG OS SAS 82.3 V82/MVS JOB T1093227 STEP SAS
PROC SAS 0:18 FRIDAY, FEBRUARY 17, 1984

NOTE: THE JOB T1093227 HAS BEEN RUN UNDER RELEASE 82.3 OF SAS AT THE UNIVERSITY OF NEW MEXICO (01403001).

NOTE: SAS OPTIONS SPECIFIED ARE:
SORT=4

1 OPTIONS MISSING=' '
2 DATA ONE;
SET GRID8.822 GRID8.823 GRID8.828;
4 IF V9=93 THEN DELETE;

NOTE: DATA SET WORK.ONE HAS 1624 OBSERVATIONS AND 38 VARIABLES. 352 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.37 SECONDS AND 228K.

5 PROC SORT; BY V42 V36 V34 V35;

NOTE: DATA SET WORK.ONE HAS 1624 OBSERVATIONS AND 38 VARIABLES. 352 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.37 SECONDS AND 312K.

6 DATA TWO; SET ONE;
7 FILE PUNCH NOTITLE;
8 LABEL V1=FLAG
9 V2=IDENTIFICATION NUMBER
10 V3=MATERIAL TYPE
11 V4=LENGTH
12 V5=WIDTH
13 V6=THICKNESS
14 V7=COMPLETENESS
15 V8=ILLUSTRATION
16 V9=TYPE
17 V10=CORTICAL COVERING
18 V11=DORSAL SCAR COUNT
19 V12=PLATFORM CHARACTERISTIC
20 V13=BREAKAGE
21 V14=MODIFICATION
22 V15=LOCATION OF MOD.
23 V16=EDGE SHAPE
24 V17=EDGE ANGLE (ORIGINAL)
25 V18=EDGE ANGLE (MODIFIED)
26 V19=PERC. EDGE MODIFICATION
27 V20=PERC. SURFACE MODIFICATION
28 V21=FORMAL TOOL TYPE
29 V22=TEXT
30 V23=GR ST TYPE
31 V24=PREPARATION
32 V25=WORN SURFACES
33 V26=CROSS-SECTION
34 V27=WEAR
35 V28=INT LENGTH
36 V29=INT WIDTH
37 V30 INT THICKNESS
38 V31=0 FOR FRAGS

2 S A S L O G OS SAS 82.3 VS2/MVS JOB T1093227 STEP SAS
 PROC SAS 0:18 FRIDAY, FEBRUARY 17, 1984

```

39          V32=WEIGHT
40          V33=CODER
41          V34=GRID NORTHING
42          V35=GRID EASTING
43          V36=GRID NUMBER
44          V42=UNIT NUMBER;
45          PUT @1  'G'
46              @2  V42      2.
47              @4  V1      CHAR1.
48              @6  V36      2.
49              @9  'N'
50              @10 V34      2.
51              @15 'E'
52              @16 V35      2.
53              @28 V33      2.
54              @30 V3      2.
55              @32 V4      3.
56              @35 V5      3.
57              @38 V6      3.
58              @41 V7      1.
59              @42 V8      1.
60              @43 V9      2.
61              @45 V10     1.
62              @46 V11     1.
63              @47 V12     1.
64              @48 V13     2.
65              @50 V14     1.
66              @51 V15     1.
67              @52 V16     1.
68              @53 V17     1.
69              @54 V18     1.
70              @55 V19     1.
71              @56 V20     1.
72              @57 V21     1.
73              @58 V22     1.
74              @59 V23     2.
75              @61 V24     1.
76              @62 V25     1.
77              @63 V26     2.
78              @65 V27     1.
79              @66 V28     3.
80              @69 V29     3.
81              @72 V30     3. @;
82          IF V9 >=60 THEN PUT @75 V31 5.;
83          IF V9<60 THEN PUT @75 V32 5.1;
  
```

NOTE: 1624 LINES WERE WRITTEN TO FILE PUNCH.

NOTE: DATA SET WORK.TWO HAS 1624 OBSERVATIONS AND 38 VARIABLES. 352 OBS/TRK.

NOTE: THE DATA STATEMENT USED 1.51 SECONDS AND 220K.

NOTE: SAS USED 312K MEMORY.

NOTE: SAS INSTITUTE INC.
SAS CIRCLE
PO BOX 8000
CARY, N.C. 27511-8000

BLANK PAGE

APPENDIX XI
SAS Analysis of Sample Unit 17

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

FASTCLUS PROCEDURE

REPLACE = FULL MAXCLUSTERS = 14 MAXITER = 1

SEED REPLACEMENTS: FIRST LEVEL = 9 SECOND LEVEL = 11

INITIAL SEEDS

CLUSTER	SCL	TCL	V11	V12	V10	V3
1	1.00000	2.00000	0.00000	3.00000	3.00000	20.00000
2	1.00000	4.00000	9.00000	3.00000	0.00000	20.00000
3	2.00000	3.00000	3.00000	3.00000	0.00000	20.00000
4	1.00000	2.00000	1.00000	0.00000	1.00000	10.00000
5	1.00000	2.00000	5.00000	3.00000	1.00000	20.00000
6	1.00000	4.00000	3.00000	1.00000	0.00000	10.00000
7	1.00000	4.00000	0.00000	0.00000	3.00000	10.00000
8	3.00000	3.00000	3.00000	1.00000	2.00000	10.00000
9	1.00000	4.00000	6.00000	3.00000	0.00000	20.00000
10	3.00000	2.00000	0.00000	1.00000	3.00000	10.00000
11	2.00000	2.00000	5.00000	1.00000	0.00000	10.00000
12	1.00000	4.00000	0.00000	3.00000	3.00000	10.00000
13	3.00000	2.00000	3.00000	3.00000	0.00000	10.00000
14	1.00000	2.00000	1.00000	1.00000	2.00000	20.00000

CLUSTER SUMMARY

CLUSTER	MEMBERS	RMS ST DEV	MAX DISTANCE FROM SEED
1	3	0.2357023	0.7302967
2	2	0.2886751	0.5
3	4	0.4082483	1.118034
4	18	0.5347408	1.951037
5	2	0.4082483	0.7071068
6	5	0.6324555	1.574802
7	8	0.4432026	1.312335
8	7	0.4960159	1.884415
9	1	.	0
10	25	0.5857404	2.303429
11	3	0.8819171	2.73252
12	3	0.4714045	1.20185
13	9	0.5853141	2.142429
14	4	0.4409586	1.06066

BEST COPY AVAILABLE

552

552

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

FASTCLUS PROCEDURE

STATISTICS FOR VARIABLES

VARIABLE	TOTAL STD	WITHIN STD	R-SQUARED	VAR RATIO
SCL	0.9153112	0.5194443	0.7229568	2.6095450
TCL	0.8802076	0.4179041	0.8060945	4.1571521
V11	1.9362552	0.6332844	0.9110877	10.2470441
V12	1.1235988	0.7309175	0.6492149	1.8507486
V10	0.9805358	0.5527582	0.7266302	2.6580483
V3	3.7783474	0.0000000	1.0000000	.
OVER-ALL	1.9280733	0.5166683	0.9388601	15.3559304

APPROXIMATE EXPECTED OVER-ALL R-SQUARED = 0.8426 CUBIC CLUSTERING CRITERION = 19.4756
WARNING: THESE VALUES ARE INVALID IF VARIABLES ARE CORRELATED

CLUSTER MEANS

CLUSTER	SCL	TCL	V11	V12	V10	V3
1	1.33333	2.00000	0.00000	3.00000	3.00000	20.00000
2	1.00000	4.00000	8.50000	3.00000	0.00000	20.00000
3	1.25000	2.75000	2.75000	3.00000	0.75000	20.00000
4	1.00000	1.66667	1.66667	0.00000	1.66667	10.00000
5	1.00000	2.00000	4.50000	3.00000	0.50000	20.00000
6	1.00000	3.20000	3.00000	2.20000	0.00000	10.00000
7	1.37500	3.62500	0.25000	0.75000	2.75000	10.00000
8	2.71429	2.57143	2.85714	0.85714	1.00000	10.00000
9	1.00000	4.00000	6.00000	3.00000	0.00000	20.00000
10	2.76000	2.16000	0.76000	1.75000	2.16000	10.00000
11	3.00000	2.00000	5.66667	2.00000	0.66667	10.00000
12	1.66667	3.66667	0.33333	3.00000	2.66667	10.00000
13	2.11111	2.22222	3.00000	3.00000	1.00000	10.00000
14	1.25000	2.25000	0.50000	1.00000	2.50000	20.00000

553

BEST COPY AVAILABLE

553

SEEDGRADE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

FASTCLUS PROCEDURE

CLUSTER STANDARD DEVIATIONS

CLUSTER	SCL	TEL	V11	V12	V10	V3
1	0.577350	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.000000	0.000000	0.707107	0.000000	0.000000	0.000000
3	0.500000	0.500000	0.500000	0.000000	0.500000	0.000000
4	0.000000	0.363682	1.154701	0.000000	0.485071	0.000000
5	0.000000	0.000000	0.707107	0.000000	0.707107	0.000000
6	0.000000	0.447214	1.000000	1.095445	0.000000	0.000000
7	0.517549	0.517549	0.462910	0.462910	0.462910	0.000000
8	0.487950	0.534522	0.377964	0.377964	0.816497	0.000000
9						
10	0.597216	0.375166	0.435890	1.032094	0.553775	0.000000
11	1.000000	0.000000	1.154701	1.414214	0.577350	0.000000
12	0.577350	0.577350	0.577350	0.000000	0.577350	0.000000
13	0.781736	0.440959	0.866025	0.000000	0.707107	0.000000
14	0.500000	0.500000	0.577350	0.000000	0.577350	0.000000

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	1	2	3	4	5	6	7
1		9.23911	3.63242	10.69398	5.15860	10.96317	10.38412
2	9.23911		5.93717	12.90349	4.50000	11.46865	13.45246
3	3.63242	5.93717		10.65755	1.93649	10.07621	10.77468
4	10.69398	12.90349	10.65755		10.91253	3.67831	3.15073
5	5.15860	4.50000	1.93649	10.91253		10.22644	11.44616
6	10.96317	11.46865	10.07621	3.67831	10.22644		4.18912
7	10.38412	13.45246	10.77468	3.15073	11.44616	4.18912	
8	10.90819	11.93370	10.33643	2.74016	10.52645	2.48144	3.57420
9	7.00793	2.50000	3.57071	11.77214	2.54951	10.50143	12.08175
10	10.24240	13.13845	10.49471	2.86570	11.01948	3.75032	2.38173
11	11.88817	10.81846	10.63668	5.06897	10.31450	3.61048	6.36587
12	10.15436	13.20459	10.51322	4.29793	11.19276	3.94011	2.27227
13	10.66088	11.64668	10.05709	3.68388	10.18744	1.95720	4.26581
14	2.13763	8.79631	3.51781	10.21233	4.91172	10.71937	10.10415

BEST COPY AVAILABLE

554

554

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
 ATTRIBUTE CLUSTERING FOR UNIT 17
 FLAKES WHOLE AND UNUTILIZED

FASCLUS PROCEDURE

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	8	9	10	11	12	13	14
1	10.90819	7.00793	10.26250	11.88837	10.15436	10.66088	2.11763
2	11.93370	2.50000	13.13845	10.81846	13.20459	11.64668	8.79631
3	10.33643	3.57071	10.49671	10.63668	10.51322	10.05709	3.51781
4	2.74016	11.77214	2.86570	5.06897	4.29793	3.68388	10.21233
5	10.52645	2.54951	11.01948	10.31450	11.19278	10.18744	4.91172
6	2.48144	10.50143	3.75032	3.61048	3.94011	1.95720	10.71917
7	3.57420	12.08175	2.38173	6.36587	2.27227	4.26581	10.10415
8	.	10.97493	2.59078	3.11750	4.00453	2.25788	10.49161
9	10.97493	.	11.83929	10.46688	11.82277	10.69556	6.60492
10	2.59078	11.83929	.	5.14307	2.33809	2.88975	10.15056
11	3.11750	10.46688	5.14307	.	6.16441	3.01027	11.58363
12	4.00453	11.82277	2.33809	6.16441	.	3.48896	10.30709
13	2.25788	10.69556	2.88975	3.01027	3.48896	.	10.64154
14	10.49161	6.60492	10.15056	11.58363	10.30709	10.64154	.

SSS

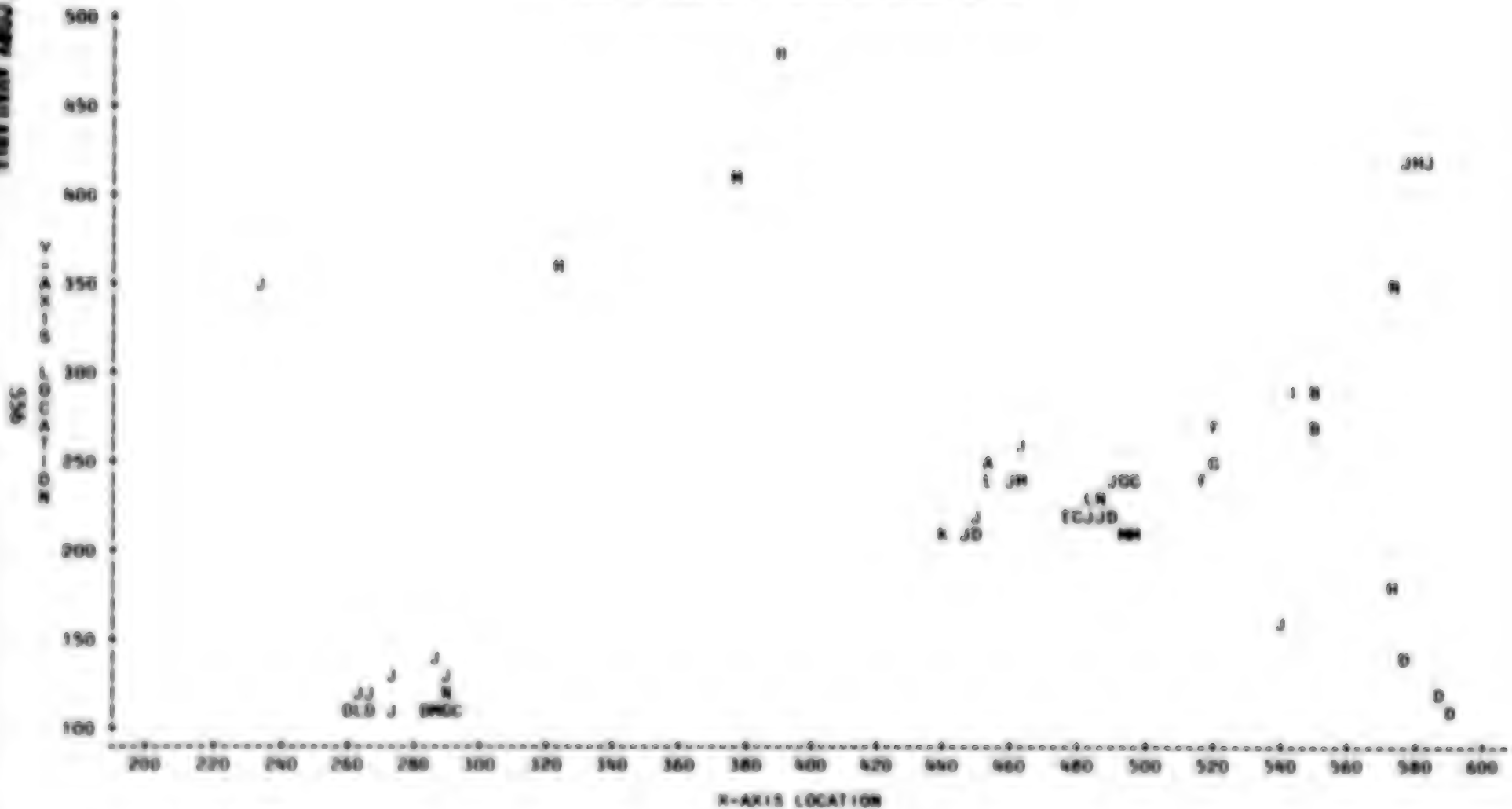
BEST COPY AVAILABLE

SSS

SEEDBRIDGE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKED WHOLE AND UNUTILIZED

PLOT OF V38*V37 SYMBOL IS VALUE OF C5

BEST COPY AVAILABLE



536

SEIOSKADEF CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

CLUSTER-1

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
1	53	452.646	252.621	35	10	20	3	.	3	2	2	0.730297
2	140	479.602	220.739	15	3	20	3	0	3	1	2	0.333333
3	264	292.755	110.127	30	6	20	3	0	3	1	2	0.333333

CLUSTER-2

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
4	104	550.762	294.876	40	2	20	0	9	3	1	4	0.5
5	105	550.569	272.165	30	1	20	0	8	3	1	4	0.5

CLUSTER-3

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
6	139	479.414	220.397	25	7	20	1	2	3	1	2	1.11803
7	262	292.851	112.812	20	3	20	1	3	3	1	3	0.50000
8	303	289.974	112.954	25	4	20	1	3	3	1	3	0.50000
9	325	266.688	116.382	55	10	20	0	3	3	2	3	1.11803

CLUSTER-4

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
10	56	489.374	215.552	.	.	10	1	.	.	1	1	0.96263
11	93	490.827	236.995	.	.	10	1	.	.	1	1	0.96263
12	122	452.539	241.554	30	9	10	1	1	0	1	2	1.14588
13	162	449.576	211.401	.	.	10	1	.	.	1	1	0.96263
14	169	589.282	113.961	.	.	10	2	.	.	1	1	0.61741
15	169	589.282	113.962	.	.	10	2	.	.	1	1	0.61741
16	170	586.210	115.138	.	.	10	2	.	.	1	1	0.61741
17	171	587.971	118.183	.	.	10	2	.	.	1	1	0.61741
18	177	578.321	136.951	35	7	10	2	3	0	1	2	1.95104
19	179	541.150	161.206	.	.	10	2	.	.	1	1	0.61741
20	250	587.074	115.629	.	.	10	2	.	.	1	1	0.61741
21	271	287.619	107.189	.	.	10	2	.	.	1	1	0.61741
22	312	283.997	110.900	35	8	10	1	1	0	1	2	1.14588
23	357	261.137	107.600	.	.	10	1	.	.	1	1	0.96263
24	359	264.020	109.092	.	.	10	2	.	.	1	1	0.61741
25	363	265.764	112.233	.	.	10	2	.	.	1	1	0.61741
26	365	266.968	112.697	.	.	10	2	.	.	1	1	0.61741
27	367	267.777	112.954	.	.	10	2	.	.	1	1	0.61741

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

CLUSTER-5

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
28	135	477.624	219.380	25	6	20	1	5	3	1	2	0.707107
29	263	291.761	112.853	15	4	20	0	4	3	1	2	0.707107

CLUSTER-6

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
30	34	521.479	268.547	30	4	10	0	2	3	1	3	1.29615
31	41	517.302	241.177	30	5	10	0	2	3	1	3	1.29615
32	210	493.457	240.346	40	4	10	0	3	1	1	4	1.44222
33	265	293.685	108.313	45	6	10	0	4	1	1	3	1.57480
34	304	289.728	112.849	25	4	10	0	4	3	1	3	1.29615

CLUSTER-7

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
35	40	520.686	251.620	65	9	10	3	0	1	2	3	1.31233
36	182	492.202	238.368	40	4	10	3	0	0	1	4	0.84984
37	220	497.959	238.973	45	7	10	3	0	1	2	3	1.31233
38	240	288.434	114.981	50	5	10	3	0	1	1	4	0.62361
39	245	289.624	114.726	40	4	10	3	0	1	1	4	0.62361
40	307	288.620	112.593	65	5	10	2	1	1	2	4	1.31233
41	308	288.770	112.408	45	4	10	2	1	0	1	4	1.17851
42	310	285.877	111.533	40	6	10	3	0	1	1	3	1.02740

CLUSTER-8

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
43	5	389.415	482.506	70	12	10	2	2	1	3	3	1.30149
44	12	324.772	363.011	70	10	10	1	3	1	2	3	0.83299
45	50	578.518	423.165	50	15	10	0	3	0	3	2	1.88442
46	65	483.670	225.760	80	15	10	1	3	1	3	3	0.51508
47	147	487.319	217.633	70	15	10	1	3	1	3	2	0.83299
48	178	572.843	181.171	45	10	10	0	3	1	2	2	1.64130
49	205	491.453	241.143	90	13	10	2	3	1	3	3	0.83299

BEST COPY AVAILABLE

558

558

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

CLUSTER=9

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
50	51	544.781	293.621	20	1	20	0	6	3	1	4	0

CLUSTER=10

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
51	16	232.929	354.857	65	15	10	2	1	3	3	2	1.42585
52	21	274.025	134.695	65	19	10	1	1	1	3	2	1.63384
53	23	288.240	144.876	50	17	10	2	1	3	3	2	1.42585
54	52	462.566	258.027	80	20	10	1	1	3	4	2	2.30343
55	91	490.608	236.555	65	15	10	2	1	3	3	2	1.42585
56	100	582.812	422.234	75	14	10	2	1	1	3	3	1.18182
57	101	578.247	423.709	30	10	10	2	1	2	2	2	0.97064
58	117	461.032	243.681	70	12	10	2	1	1	3	3	1.18182
59	134	451.462	218.205	50	10	10	2	1	3	2	2	1.57721
60	142	482.908	218.190	45	10	10	2	1	1	2	2	1.18182
61	146	487.315	217.726	45	10	10	2	1	3	2	2	1.57721
62	158	447.748	209.798	75	15	10	2	1	3	3	2	1.42585
63	179	541.150	161.206	40	12	10	2	1	1	2	2	1.18182
64	184	492.746	238.250	55	18	10	2	1	1	3	2	0.97064
65	206	490.328	238.948	70	11	10	2	1	0	3	3	1.96246
66	241	289.229	114.845	55	11	10	3	0	1	2	2	1.39361
67	256	288.758	131.371	60	15	10	3	0	1	3	2	1.21967
68	257	289.436	128.612	45	12	10	2	1	.	2	2	1.02045
69	287	273.685	107.752	80	20	10	2	1	1	4	2	1.57721
70	305	288.770	112.926	40	8	10	2	1	3	2	2	1.57721
71	319	264.738	118.099	60	16	10	3	0	1	3	2	1.21967
72	320	266.717	118.470	70	17	10	2	1	1	3	2	0.97064
73	321	265.569	118.944	90	13	10	3	0	1	3	3	1.39361
74	323	265.819	119.495	75	15	10	3	0	3	3	2	1.60577
75	369	267.515	115.403	65	20	10	3	0	1	3	2	1.21967

CLUSTER=11

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
76	92	490.839	236.524	90	20	10	1	7	.	4	2	2.73252
77	96	491.612	237.254	60	17	10	1	5	3	3	2	2.13437
78	150	438.624	213.476	50	10	10	0	5	1	2	2	0.74536

559

BEST COPY AVAILABLE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

----- CLUSTER=12 -----

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
79	64	483.822	225.692	50	6	10	3	0	3	1	4	0.88192
80	121	453.138	242.510	60	7	10	3	0	3	2	4	0.66667
81	354	263.635	105.485	50	8	10	2	1	3	2	3	1.20185

----- CLUSTER=13 -----

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
82	4	375.876	413.475	55	10	10	1	3	3	2	3	0.99499
83	59	493.354	213.279	55	13	10	1	3	3	3	2	0.62450
84	60	495.798	214.519	70	18	10	1	3	3	3	2	0.62450
85	77	487.338	230.140	55	10	10	2	4	3	2	3	1.84120
86	94	490.644	237.219	50	11	10	0	1	3	2	2	2.14243
87	118	461.946	242.754	30	8	10	1	4	3	1	2	1.78606
88	178	572.843	181.171	35	7	10	1	3	3	1	2	1.41067
89	270	288.007	106.940	45	11	10	2	3	3	2	2	1.17898
90	272	287.849	107.936	55	15	10	0	3	3	3	2	1.09087

----- CLUSTER=14 -----

OBS	V2	V37	V38	V4	V6	V3	V10	V11	V12	SCL	TCL	DISTANCE
91	75	486.916	228.270	20	4	20	2	1	1	1	2	0.79057
92	103	572.528	346.381	40	6	20	2	1	1	1	3	1.06066
93	237	289.604	117.102	30	6	20	3	0	1	1	2	0.79057
94	302	270.156	112.992	40	9	20	3	0	1	2	2	1.06066

SEIOSKADIS CULTURAL RESOURCES ASSESSMENT PROJECT
 ATTRIBUTE CLUSTERING FOR UNIT 17
 FLAKES WHOLE AND UNUTILIZED

CLUSTER-1									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
1	3	0.235702	0.730297	1.33333	2	0	3	3	20
CLUSTER-2									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
2	2	0.288675	0.5	1	4	8.5	3	0	20
CLUSTER-3									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
3	4	0.408248	1.11803	1.25	2.75	2.75	3	0.75	20
CLUSTER-4									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
4	18	0.534741	1.95104	1	1.16667	1.625	0	1.625	10
CLUSTER-5									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
5	2	0.408248	0.707107	1	2	4.5	3	0.5	20
CLUSTER-6									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
6	5	0.632456	1.5748	1	3.2	3	2.1875	0	10
CLUSTER-7									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
7	8	0.443203	1.31233	1.375	3.625	0.25	0.75	2.75	10

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
ATTRIBUTE CLUSTERING FOR UNIT 17
FLAKES WHOLE AND UNUTILIZED

----- CLUSTER=8 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
8	7	0.496016	1.88442	2.71429	2.57143	2.8125	0.855469	1	10
----- CLUSTER=9 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
9	1	.	0	1	4	6	1	0	20
----- CLUSTER=10 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
10	25	0.58574	2.30343	2.76	2.16	0.757813	1.75	2.125	10
----- CLUSTER=11 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
11	1	0.881917	2.73252	1	2	5.625	2	0.664063	10
----- CLUSTER=12 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
12	3	0.471605	1.20185	1.66667	1.66667	0.332031	3	2.625	10
----- CLUSTER=13 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
13	9	0.585314	2.14243	2.11111	2.22222	3	3	1	10
----- CLUSTER=14 -----									
OBS	FREQ	RMSSTD	RADIUS	SCL	TCL	V11	V12	V10	V3
14	4	0.440959	1.06066	1.25	2.25	0.5	1	2.5	20

APPENDIX XII
SAS Cluster Analysis of Sample Unit 17

BLANK

PAGE

11:33 THURSDAY, FEBRUARY 23, 1984 1

SEEDSHADE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

REPLACE = FULL MAXCLUSTERS = 40 MAXITER = 1

SEED REPLACEMENTS: FIRST LEVEL = 94 SECOND LEVEL = 58

BEST COPY AVAILABLE

964

564

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

INITIAL SEEDS		
CLUSTER	V37	V38
1	446.2684	417.0682
2	400.1243	420.5849
3	550.7619	294.8761
4	375.8764	413.4745
5	389.4147	482.9676
6	490.3282	238.9482
7	326.2245	517.8941
8	579.8385	124.5751
9	439.1814	212.0435
10	462.5657	258.0272
11	328.9452	360.4014
12	442.4060	196.1972
13	304.1471	383.1768
14	242.2683	367.2259
15	534.9150	304.9046
16	550.5693	272.1654
17	269.0839	101.2005
18	232.2668	354.2174
19	186.0363	389.0942
20	188.3016	228.4091
21	274.0253	134.6945
22	511.9721	236.9421
23	590.1784	142.3024
24	449.5391	232.4538
25	477.6242	219.3804
26	461.3489	132.2787
27	290.7053	113.8874
28	291.0117	148.2808
29	570.4096	366.9582
30	502.9135	111.8986
31	583.9113	101.1673
32	572.8434	181.1712
33	260.9792	121.2261
34	521.4791	268.5470
35	578.2467	423.7086
36	541.1503	161.2062
37	495.7979	214.5192
38	458.7735	217.9500
39	520.8356	251.4163
40	572.5275	346.3809

565

BEST COPY AVAILABLE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

CLUSTER LISTING

Obs	V2	CLUSTER	DISTANCE FROM SEED
1		1	0
2		2	1.853205
3		2	1.853205
4		4	0
5		5	0
6		7	0.5260064
7		7	1.680875
8		7	1.441585
9		7	0.5103499
10		7	0.7159742
11		11	2.461169
12		11	2.461169
13		13	0
14		14	0
15		18	0.6484255
16		18	0.2420718
17		18	0.2665666
18		18	0.8637484
19		19	0
20		20	0
21		21	4.899259
22		21	4.562318
23		28	0.5659499
24		28	1.727478
25		28	1.988109
26		28	1.102043
27		28	0.8314747
28		28	4.276016
29		39	3.427642
30		34	3.068673
31		34	2.358503
32		34	4.214537
33		39	4.71003
34		34	5.353519
35		39	1.79735
36		39	1.066628
37		39	2.161871
38		39	3.058902
39		39	2.937759
40		39	2.798501
41		22	2.46166
42		22	1.951845
43		22	1.967771
44		22	2.143064

566

BEST COPY AVAILABLE

566

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

OBS	V2	CLUSTER	DISTANCE FROM SEED
45		22	2.556815
46		22	4.781941
47		22	4.853377
48		6	7.895765
49		35	1.346919
50		3	3.055603
51		10	10.25082
52		10	10.03734
53		37	2.849749
54		37	3.437592
55		37	1.914886
56		37	1.540732
57		37	0.4960775
58		37	5.181614
59		37	6.339327
60		15	0
61		25	0.6919311
62		25	2.917606
63		25	3.496194
64		25	3.496194
65		25	3.534397
66		25	3.66424
67		25	3.718312
68		25	4.410761
69		25	4.985753
70		25	6.221252
71		25	5.278734
72		37	2.905988
73		37	6.992517
74		37	7.985746
75		25	7.108494
76		25	6.703508
77		6	8.371435
78		6	7.747327
79		6	7.72523
80		6	7.577709
81		6	6.968856
82		6	6.883584
83		6	7.139947
84		6	7.250804
85		6	2.385809
86		6	5.583791
87		6	4.55154
88		6	1.759229
89		6	4.130561

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

OBS	V2	CLUSTER	DISTANCE FROM SEED
90	90	6	2.047038
91	91	6	1.544901
92	93	6	1.248529
93	94	6	1.441595
94	95	6	1.162829
95	97	6	0.6242885
96	98	6	1.335446
97	99	31	7.613643
98	100	35	3.060104
99	101	35	1.747106
100	102	29	0
101	103	40	0
102	104	3	3.055603
103	105	16	0
104	106	10	3.355675
105	107	10	3.112672
106	108	10	2.543701
107	109	10	5.468464
108	110	10	5.169419
109	111	10	2.729922
110	112	10	3.408055
111	113	10	1.550033
112	114	10	3.180381
113	115	10	3.139868
114	116	10	3.897748
115	117	10	4.183318
116	118	10	5.146816
117	119	10	4.678152
118	120	10	5.745568
119	121	24	7.322644
120	122	24	6.467857
121	123	24	2.471262
122	124	24	5.133987
123	125	24	5.648794
124	126	24	6.48125
125	127	38	7.560192
126	128	38	4.734854
127	129	38	3.73133
128	130	38	4.232007
129	131	38	1.77723
130	132	38	4.259693
131	133	9	4.050532
132	134	38	2.134278
133	135	25	6.194803
134	136	25	6.119761

GLEDSKADIE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

OBS	V2	CLUSTER	DISTANCE FROM SEED
135		25	5.831583
136		25	4.703161
137		25	4.138039
138		25	3.821524
139		25	2.920465
140		25	4.085887
141		25	6.0696
142		25	3.671753
143		25	3.838064
144		37	2.82507
145		37	2.808706
146		37	1.899428
147		37	2.408536
148		9	5.402771
149		9	4.802091
150		9	3.82654
151		9	2.625293
152		9	3.02669
153		9	1.872985
154		12	0
155		9	7.216703
156		9	4.710539
157		9	7.636343
158		9	3.472259
159		9	4.877239
160		9	5.746793
161		38	5.755445
162		38	6.345333
163		38	4.401722
164		38	5.5427
165		31	12.24554
166		31	8.803671
167		31	6.291952
168		31	6.294476
169		31	7.226151
170		8	6.633247
171		8	5.111335
172		8	5.477181
173		8	5.784782
174		23	4.043231
175		23	4.627751
176		23	8.837104
177		32	7.10543E-15
178		32	7.10543E-15
179		32	7.10543E-15

SEEDSKADIE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

Obs	V2	CLUSTER	DISTANCE FROM SEED
180	179	16	1.06581E-14
181	179	16	1.06581E-14
182	180	10	0
183	181	26	0
184	182	6	1.131755
185	183	6	1.58099
186	184	6	1.381649
187	185	6	4.509209
188	200	6	7.537849
189	201	6	7.168676
190	202	6	7.135754
191	203	6	5.334985
192	204	6	4.521906
193	205	6	4.147027
194	206	6	2.584647
195	207	6	3.291652
196	208	6	3.769831
197	209	6	3.269272
198	210	6	3.581007
199	211	6	3.265527
200	211	6	3.265527
201	212	6	2.430777
202	213	6	2.010808
203	214	6	1.7473
204	215	6	2.672767
205	216	6	2.887027
206	217	6	3.864966
207	218	6	3.856462
208	219	6	4.496706
209	220	6	6.193133
210	221	6	3.810361
211	222	23	7.362506
212	223	27	6.289832
213	224	27	4.03776
214	225	27	3.729311
215	226	27	6.122107
216	227	27	7.659804
217	228	27	7.832753
218	229	27	8.15097
219	230	27	8.209921
220	231	27	7.607786
221	232	27	6.115056
222	233	27	2.965036
223	234	27	3.218753
224	235	27	4.274524

570

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

CBS	V2	CLUSTER	DISTANCE FROM SEED
225	236	27	5.349814
226	237	27	5.174976
227	238	27	4.079479
228	239	27	3.88066
229	240	27	3.181517
230	241	27	2.913971
231	242	27	3.888344
232	243	27	4.074684
233	245	27	2.806464
234	246	27	3.413999
235	247	27	3.602751
236	248	27	3.273743
237	249	27	2.909985
238	250	31	7.639497
239	255	21	10.8692
240	256	21	10.20373
241	257	21	11.75464
242	258	27	15.30694
243	259	27	6.058835
244	260	27	6.138838
245	261	27	6.050817
246	262	27	3.612194
247	263	27	2.583069
248	263	27	2.583069
249	264	27	3.857352
250	265	27	5.650009
251	266	27	6.641821
252	267	27	5.672112
253	268	27	5.349228
254	268	27	5.349228
255	270	27	5.169727
256	271	27	5.049832
257	272	27	4.269309
258	273	27	3.463242
259	274	27	3.326097
260	275	27	2.839191
261	276	27	2.232638
262	277	27	1.51628
263	278	27	1.108531
264	279	27	1.037885
265	280	27	0.9193757
266	281	27	0.6540929
267	282	27	0.290515
268	283	27	0.493022
269	284	27	9.405063

571

BEST COPY AVAILABLE

571

SEEDSKATTE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

OBS	V2	CLUSTER	DISTANCE FROM SEED
270	285	17	7.302377
271	287	17	5.977176
272	288	17	3.55775
273	289	17	2.449259
274	290	17	2.81535
275	291	17	2.00887
276	292	17	1.321396
277	293	17	2.182254
278	294	17	2.538423
279	295	17	2.043401
280	296	17	2.14959
281	297	17	1.236121
282	298	17	0.1615568
283	299	17	0.4880733
284	300	27	2.379546
285	301	27	1.965075
286	302	27	1.332764
287	303	27	1.197365
288	304	27	0.9917002
289	305	27	1.14804
290	306	27	1.350465
291	307	27	0.9819261
292	308	27	0.7478278
293	309	27	2.201642
294	310	27	3.493755
295	311	27	5.305828
296	312	27	5.449538
297	313	27	4.506437
298	314	27	8.338956
299	315	33	8.755084
300	316	33	4.366876
301	317	33	6.252162
302	318	33	5.410984
303	319	33	1.365506
304	320	33	1.644554
305	321	33	1.793142
306	322	33	2.023238
307	323	33	2.339504
308	324	33	2.345532
309	325	33	1.235407
310	350	17	1.021992
311	351	17	0.8697695
312	352	.	.
313	353	17	6.056831
314	354	17	4.416388

572

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

OBS	V2	CLUSTER	DISTANCE FROM SEED
315	355	17	3.629163
316	356	17	6.787414
317	357	17	6.62405
318	358	17	5.557348
319	359	17	4.219161
320	360	17	3.226315
321	361	17	4.100433
322	362	33	5.071536
323	363	33	4.924207
324	364	33	4.711536
325	365	33	4.630401
326	366	33	4.42949
327	367	33	4.676744
328	368	21	11.65532
329	369	33	2.505512

573

BEST COPY AVAILABLE

573

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

CLUSTER SUMMARY

CLUSTER	MEMBERS	RMS ST DEV	MAX DISTANCE FROM SEED
1	1	.	0
2	2	1.853205	1.853205
3	2	3.055603	3.055603
4	1	.	0
5	1	.	0
6	48	3.348818	8.371435
7	5	0.8626462	1.680875
8	4	4.582385	6.633247
9	13	3.215762	7.216703
10	17	3.722629	10.25082
11	2	2.461169	2.461169
12	1	.	0
13	1	.	0
14	1	.	0
15	1	.	0
16	1	.	0
17	25	2.814496	7.302377
18	4	0.4647891	0.8637484
19	1	.	0
20	1	.	0
21	6	7.197656	11.75464
22	7	2.437448	4.853377
23	4	5.00901	8.837104
24	6	4.40897	7.322644
25	24	3.380077	7.108494
26	1	.	0
27	69	3.446317	15.30694
28	6	1.65672	4.276016
29	1	.	0
30	1	.	0
31	7	6.081295	12.24554
32	3	0	7.10543E-15
33	18	3.114699	8.755084
34	4	3.081158	5.353519
35	3	1.886187	3.060104
36	2.00000587884		1.06581E-14
37	14	3.036014	7.985746
38	11	3.574603	7.560192
39	8	2.144298	4.71003
40	1	.	0

57L

SEEDSRADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

STATISTICS FOR VARIABLES

VARIABLE	TOTAL STD	WITHIN STD	R-SQUARED	VAR RATIO
V57	111.75142	3.16632	0.99929	1400.70734
V18	86.92683	3.68770	0.99841	629.88879
OVER-ALL	99.83275	3.43691	0.99896	956.99996

APPROXIMATE EXPECTED OVER-ALL R-SQUARED = 0.9814 CUBIC CLUSTERING CRITERION = 93.2547
WARNING: THESE VALUES ARE INVALID IF VARIABLES ARE CORRELATED

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

CLUSTER MEANS

CLUSTER	V17	V38
1	446.2684	417.0682
2	398.6422	419.4724
3	547.7714	204.2485
4	375.8764	413.4745
5	389.4147	482.9676
6	492.3003	237.4114
7	327.5146	518.9716
8	585.7179	125.2029
9	443.9526	212.5875
10	461.1684	247.5380
11	326.8585	361.7064
12	442.8060	196.1972
13	304.1471	383.1768
14	242.2683	367.2259
15	534.9150	304.9046
16	550.5693	272.1654
17	267.7426	107.1069
18	233.0237	354.6337
19	186.0363	389.0942
20	188.3016	228.4091
21	280.5797	132.7971
22	516.4228	238.8776
23	584.7635	138.5066
24	452.7744	235.4624
25	483.3990	222.7644
26	461.3489	132.2787
27	289.3461	111.6916
28	287.9108	145.3365
29	570.4096	366.9582
30	502.9135	111.8986
31	587.1019	110.1040
32	572.8434	181.1712
33	265.7263	117.1574
34	522.3046	262.3218
35	579.8591	423.0360
36	541.1503	161.2062
37	490.1103	217.3190
38	453.5014	219.8425
39	521.4613	253.5230
40	572.5275	346.3809

576

BEST COPY AVAILABLE

576

SEEDSRADII CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

CLUSTER STANDARD DEVIATIONS

CLUSTER	.V37	V38
1	.	.
2	2.096090	1.573259
3	4.229150	0.887529
4	.	.
5	.	.
6	2.616103	3.947673
7	0.937900	0.780167
8	3.945211	5.141189
9	3.607473	2.769184
10	3.269491	4.126301
11	2.951063	1.845516
12	.	.
13	.	.
14	.	.
15	.	.
16	.	.
17	3.472027	1.946229
18	0.577443	0.314035
19	.	.
20	.	.
21	9.762704	2.881338
22	3.190040	1.306121
23	6.607635	2.553337
24	1.835746	2.958865
25	3.192933	3.557390
26	.	.
27	2.780227	4.003067
28	1.803616	1.495465
29	.	.
30	.	.
31	5.179457	6.865677
32	0.000000	0.000000
33	1.896340	3.975750
34	1.229944	4.180227
35	2.561112	0.745728
36	0.000008	0.000003
37	2.319252	3.613286
38	2.713516	4.265255
39	1.765234	2.465760
40	.	.

577

BEST COPY AVAILABLE

577

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	1	2	3	4	5	6	7	8	9	10
1		47.6869	159.3347	70.4837	87.0349	185.4602	156.4825	323.4679	204.4938	170.1837
2	47.6869		194.7320	23.5427	64.1622	204.7390	122.3079	348.7002	211.7885	182.9507
3	159.3347	194.7320		209.1955	246.3570	79.4197	314.6642	173.2522	132.0866	98.3969
4	70.4837	23.5427	209.1955		70.7995	211.0753	116.0538	356.5586	212.1084	186.5734
5	87.0349	64.1622	246.3570	70.7995		266.2392	71.6094	408.0815	275.8256	246.1213
6	185.4602	204.7390	79.4197	211.0753	266.2392		326.2368	146.0054	54.3483	32.7376
7	156.4825	122.3079	314.6642	116.0538	71.6094	326.2368		470.8744	327.7636	302.5549
8	323.4679	348.7002	173.2522	356.5586	408.0815	146.0054	470.8744		166.5337	174.5809
9	204.4938	211.7885	132.0866	212.1084	275.8256	54.3483	327.7636	166.5337		38.9605
10	170.1837	182.9507	98.3969	186.5734	246.1213	32.7376	302.5549	38.9605	38.9605	
11	131.6193	92.1401	230.9829	71.2930	136.4462	206.9305	157.2665	350.6310	189.5982	176.2769
12	220.9048	227.5239	143.9303	227.2348	291.6254	64.7152	342.6125	159.9328	16.4632	54.6618
13	146.1065	101.2259	259.3473	77.8655	131.2584	238.0109	137.7906	381.8804	220.5590	207.4935
14	210.0008	164.8712	314.0985	141.3862	187.2117	281.7230	174.0508	420.1581	254.1448	249.4844
15	142.9646	178.0339	16.6985	192.5635	229.9495	79.8207	298.0597	186.7448	129.6017	93.4317
16	178.5371	211.6157	22.2597	224.6907	265.3458	67.8462	332.6661	151.1072	122.1337	92.7310
17	357.6974	338.6841	336.8057	324.8908	395.0638	259.6256	416.1793	318.4899	205.3682	239.0281
18	222.1968	177.8583	320.4879	154.4964	202.3061	284.5443	189.5666	420.7514	254.2993	252.0307
19	261.7314	214.7653	373.9626	191.3992	223.9978	341.7680	192.0527	478.9405	312.5307	309.4120
20	319.5922	284.1625	365.4496	263.5024	324.4172	304.1320	322.1906	410.5987	256.1401	273.5365
21	329.0332	310.0347	312.1826	296.4141	366.6940	236.1563	389.0162	305.2327	181.8164	213.9574
22	191.5033	215.6078	63.6291	224.1369	275.1563	24.1669	337.8445	133.1306	77.0915	55.9290
23	311.0907	337.0206	160.0748	345.3132	395.9981	135.3942	459.2718	13.3379	159.1091	164.8138
24	181.7223	191.8071	111.7150	193.9114	255.4864	39.5740	309.9475	172.7169	24.5170	14.7065
25	197.8197	214.1909	96.1966	218.9325	276.6564	17.1397	334.7217	141.3769	40.7380	33.2856
26	285.1884	293.9598	183.5839	293.8990	357.9905	109.5941	409.1980	124.5702	82.1714	115.2595
27	343.3358	326.6109	316.4027	313.9434	384.5252	238.7381	409.0646	296.6796	184.6162	219.0369
28	314.5080	295.6551	299.5034	282.1985	352.5590	224.1715	375.7282	298.4869	169.9168	201.1550
29	133.8732	179.6156	76.1524	200.0173	214.9822	151.2726	286.5415	242.2394	199.5537	161.8481
30	310.3823	324.7679	187.7864	327.2408	388.0390	125.9608	443.2530	83.8664	116.6819	141.9180
31	337.7293	362.2511	188.2979	369.6619	422.0279	158.7278	484.3122	15.1622	176.0528	186.4065
32	267.7099	295.1838	115.8234	304.5666	353.1673	98.2351	417.4869	57.4300	132.6643	129.9071
33	350.0599	330.2438	333.0325	316.1279	386.1553	256.5089	406.5371	320.0927	202.1670	234.9398
34	172.4179	199.9717	40.8396	210.4480	257.5739	38.9972	322.1991	151.0723	92.8038	62.8983
35	133.7239	181.2520	132.7247	204.2067	199.6519	205.2390	269.9656	297.8907	250.5178	211.8656
36	272.8881	294.9746	133.2070	301.5871	355.7445	90.5183	416.6969	57.2932	109.9429	117.6873
37	204.5039	221.8838	96.1402	226.9942	284.0929	20.2114	342.6830	132.7637	46.3996	41.8429
38	197.3582	207.0305	120.0961	208.6121	270.8171	42.5913	324.5780	162.5972	11.9923	28.7371
39	180.0028	206.4552	48.4849	216.2857	264.7285	33.3158	328.7526	143.5094	87.6545	60.5893
40	144.6999	188.6226	57.7118	207.7817	228.4431	135.3172	299.6980	221.5709	185.5591	148.8985

SEFOB-ADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	11	12	13	14	15	16	17	18	19	20
1	131.6193	220.9048	146.1065	210.0008	142.9646	178.5371	357.6974	222.1968	261.7314	319.5922
2	92.1401	227.5239	101.2259	164.8712	178.0339	211.6157	338.6841	177.8583	214.7653	284.1625
3	230.9829	143.9303	259.3473	314.0985	16.6985	22.2597	336.8057	320.4879	373.9626	365.4496
4	71.2930	227.2348	77.8655	141.3862	192.5635	224.6907	324.8908	154.4964	191.3992	263.5024
5	136.4462	291.6254	131.2584	187.2117	229.9495	265.3458	395.0638	202.3061	223.9978	324.4172
6	206.9305	64.7152	238.0109	281.7230	79.8207	67.8462	259.6256	284.5443	341.7680	304.1320
7	157.2665	342.6125	137.7906	174.0508	298.0597	332.6661	416.1793	189.5666	192.0527	322.1906
8	350.6310	159.9328	381.8804	420.1581	186.7448	151.1072	318.4899	420.7514	478.9405	410.5987
9	189.5982	16.4632	220.5590	254.1448	129.6017	122.1337	205.3682	254.2993	312.5307	256.1401
10	176.2769	54.6618	207.4935	249.4844	93.4317	92.7310	239.0281	252.0307	309.4120	273.5365
11		201.8528	31.2536	84.7701	215.6709	240.9650	261.3725	94.1010	143.4608	192.2660
12	201.8528		232.5444	263.2602	142.7418	132.1759	196.0724	262.5701	320.8344	256.1380
13	31.2536	232.5444		63.9016	243.6808	270.2729	278.4598	76.6372	118.2590	193.3215
14	84.7701	263.2602	63.9016		299.2090	322.6237	261.3634	15.6214	60.3345	148.9379
15	215.6709	142.7418	243.6808	299.2090		36.2893	332.4230	305.9597	358.8931	354.9541
16	240.9650	132.1759	270.2729	322.6237	36.2893		327.4679	328.0797	382.8272	364.9007
17	261.3725	196.0724	278.4598	261.3634	332.4230	327.4679		249.9498	293.5860	145.0003
18	94.1010	262.5701	76.6372	15.6214	305.9597	328.0797	249.9498		58.2696	133.9130
19	143.4608	320.8344	118.2590	60.3345	358.8931	382.8272	293.5860	58.2696		160.7010
20	192.2660	256.1380	193.3215	148.9379	354.9541	364.9007	145.0003	133.9130	160.7010	
21	233.5406	173.8025	251.4864	237.5388	307.0752	303.8386	28.7189	226.8767	273.1788	132.8793
22	225.8794	85.4407	256.6772	302.7110	68.5677	47.6871	281.4345	306.1283	362.9328	328.2881
23	341.0764	153.6029	372.3024	411.8440	173.7043	137.9634	318.5721	412.8339	470.9326	406.5274
24	178.3041	40.6111	209.5462	248.3434	107.5607	104.4556	225.1930	249.9843	307.8180	264.5668
25	209.3079	48.8492	240.5480	281.0928	96.9583	83.3805	244.7128	282.9793	340.7200	295.1514
26	265.9412	66.6663	296.0781	321.2421	187.6477	165.9173	195.2358	318.7070	376.4986	289.4752
27	252.8134	174.8385	271.8884	259.8348	312.4665	306.5769	22.0847	249.3854	296.0154	154.3794
28	219.8474	162.6517	238.3939	226.5352	294.0630	291.6763	43.2233	216.3745	264.1898	129.7038
29	243.6077	213.4110	266.7560	328.1414	71.4878	96.8468	398.9110	337.6109	385.0102	406.4509
30	305.6131	103.7662	336.3034	364.8672	195.6411	167.2021	235.2198	362.9888	421.0090	335.4928
31	361.9812	168.3714	393.2330	430.1418	201.6699	166.1280	319.3734	430.3094	488.5582	415.9781
32	305.1754	131.3000	336.1606	379.3366	129.4160	93.6807	313.9618	381.5320	439.1488	387.4323
33	252.0741	193.5535	268.7796	251.1664	328.1943	324.2884	10.2508	239.7174	283.3727	135.5416
34	219.2635	103.7124	249.3965	299.0405	44.4108	29.9298	298.1501	303.6526	359.3711	335.7202
35	260.3279	265.2343	278.5783	342.1730	126.3922	153.6875	444.1035	353.5162	395.2828	437.2607
36	293.4643	104.7607	324.7175	363.0077	143.8337	111.3583	278.7086	363.8079	421.9465	359.1914
37	217.9424	52.1713	249.1809	289.6511	98.3803	81.6297	248.1816	291.4599	349.2388	302.0124
38	190.1678	26.1192	221.3251	257.5681	117.7443	110.2717	217.2917	258.4165	316.5181	265.3382
39	222.6520	97.6524	253.0525	301.4583	53.1138	34.5661	292.9349	305.6463	361.7866	334.1050
40	246.1466	198.7128	270.8911	330.9164	55.9909	77.3958	387.4866	339.6041	388.8443	401.9290

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	21	22	23	24	25	26	27	28	29	30
1	329.0332	191.5033	311.0907	181.7223	197.8197	285.1884	343.3358	314.5080	133.8732	310.3823
2	310.0347	215.6078	337.0206	191.8071	214.1909	293.9598	326.6109	295.6551	179.6156	324.7679
3	312.1826	63.6291	160.0748	111.7150	96.1966	183.5839	316.4027	299.5034	76.1524	187.7864
4	296.4141	224.1369	345.3132	193.9114	218.9325	293.8990	313.9434	282.1985	200.0173	327.2408
5	366.6940	275.1563	395.9981	255.4864	276.6564	357.9905	384.5252	352.5590	214.9822	388.0390
6	236.1563	24.1669	135.3942	39.5740	17.1397	109.5941	238.7381	224.1715	151.2726	125.9608
7	389.0162	337.8445	459.2718	309.9475	334.7217	409.1980	409.0646	375.7282	286.5415	443.2530
8	305.2327	133.1306	13.3379	172.7169	141.3769	124.5702	296.6796	298.4869	242.2394	83.8664
9	181.8164	77.0915	159.1091	24.5170	40.7380	82.1714	184.6162	169.9168	199.5537	116.6819
10	213.9574	55.9290	164.8138	14.7065	33.2856	115.2595	219.0369	201.1550	161.8481	141.9180
11	233.5406	225.8794	341.0764	178.3041	209.3079	265.9412	252.8134	219.8474	243.6077	305.6131
12	173.8025	85.4407	153.6029	40.6111	48.8492	66.6663	174.8385	162.6517	213.4110	103.7662
13	251.4864	256.6772	372.3024	209.5462	240.5480	296.0781	271.8884	238.3939	266.7560	336.3034
14	237.5388	302.7110	411.8440	248.3434	281.0928	321.2421	259.8348	226.5352	328.1414	364.8672
15	307.0952	68.5677	173.7043	107.5607	96.9583	187.6477	312.4665	294.0630	71.4878	195.6411
16	303.8366	47.6871	137.9634	104.4556	83.3805	165.9173	306.5769	291.6763	96.8468	167.2021
17	28.7189	281.4345	318.5721	225.1930	244.7128	195.2358	22.0847	43.2233	398.9110	235.2198
18	226.8767	306.1283	412.8339	249.9843	282.9793	318.7070	249.3854	216.3745	337.6109	362.9888
19	273.1788	362.9328	470.9326	307.8180	340.7200	376.4986	296.0154	264.1898	385.0102	421.0090
20	132.8793	328.2881	406.5274	264.5668	295.1514	289.4752	154.3794	129.7038	406.4509	335.4928
21	.	258.6021	304.2373	200.4773	221.8778	180.7699	22.8537	14.5252	372.6027	223.3138
22	258.6021	.	121.4282	63.7400	36.7452	119.9852	260.2693	246.9163	138.9935	127.6957
23	304.2373	121.4282	.	163.7729	131.8110	123.5716	296.6318	296.9312	228.9021	86.0662
24	200.4773	63.7400	163.7729	.	33.1527	103.5393	205.0073	187.8901	176.4346	133.3490
25	221.8778	36.7452	131.8110	33.1527	.	93.1336	223.5927	210.2634	168.4122	112.5703
26	180.7699	119.9852	123.5716	103.5393	93.1336	.	173.2304	173.9289	258.7831	46.2923
27	22.8537	260.2693	296.6318	205.0073	223.5927	173.2304	.	33.6755	379.6810	213.5675
28	14.5252	246.9163	296.9312	187.8901	210.2634	173.9289	33.6755	.	359.0567	217.5874
29	372.6027	138.9935	228.9021	176.4346	168.4122	258.7831	379.6810	359.0567	.	263.8392
30	223.3138	127.6957	86.0662	133.3490	112.5703	46.2923	213.5675	217.5874	263.8392	.
31	307.3611	146.8952	28.4987	183.7352	153.1231	127.6931	297.7600	301.2584	257.3960	84.2075
32	296.2399	80.7051	44.2985	131.7729	98.6423	121.7435	291.8871	287.1771	185.8029	98.4321
33	21.5690	278.6835	319.7506	221.3211	241.9384	196.2061	24.2440	35.8638	393.9953	237.2455
34	274.2400	24.1708	138.6770	74.5378	55.4836	143.6203	277.4151	261.1645	115.1645	151.6680
35	416.9014	194.7780	284.5717	226.5709	22.2909	313.9816	425.8323	402.9278	56.8684	320.5107
36	262.1146	81.5126	49.1669	115.4309	84.4076	84.8826	256.6262	253.7362	207.8220	62.3962
37	225.9359	34.0164	123.1691	41.5109	8.6426	89.7724	226.8555	214.6302	169.8229	106.1951
38	193.5945	65.7376	154.4191	15.6368	30.0400	87.9147	196.5797	181.5803	187.9109	118.7159
39	269.4414	15.4878	131.2857	71.0217	48.9370	135.3280	272.0177	257.3910	123.5454	142.8338
40	361.7341	121.2629	208.2341	163.2291	152.3972	241.2476	367.7917	348.4616	20.6860	244.5978

580

BEST COPY AVAILABLE

580

SEEDSKADDEE CULTURAL RESOURCES ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

FASTCLUS PROCEDURE

DISTANCES BETWEEN CLUSTER MEANS

CLUSTER	31	32	33	34	35	36	37	38	39	40
1	337.7293	267.7099	350.0599	172.4179	133.7239	272.8881	204.5039	197.3582	180.0028	144.6999
2	362.2511	295.1838	330.2438	199.9717	181.2520	294.9746	221.8838	207.0305	206.4552	188.6226
3	188.2979	115.8234	333.0325	40.8396	132.7247	133.2070	96.1402	120.0961	48.4849	57.7118
4	369.6619	304.5666	316.1279	210.4480	204.2067	301.5871	226.9942	208.6121	216.2857	207.7817
5	422.0279	353.1673	386.1553	257.5739	199.6519	355.7445	284.0929	270.8171	264.7285	228.4431
6	158.7278	98.2351	256.5089	38.9972	205.2390	90.5183	20.2114	42.5913	33.3158	135.3172
7	484.3122	417.4869	406.5371	322.1991	269.9656	416.6969	342.6830	324.5780	328.7526	299.6980
8	15.1622	57.4300	320.0927	151.0723	297.8907	57.2932	132.7637	162.5972	143.5094	221.5709
9	176.0528	132.6643	202.1670	92.8038	250.5178	109.9429	46.3996	11.9923	87.6545	185.5591
10	186.4065	129.9071	234.9398	62.8983	211.8656	117.6873	41.8429	28.7371	60.5893	148.8985
11	361.9812	305.1254	252.0741	219.2635	260.3279	293.4643	217.9424	190.1678	222.6520	246.1466
12	168.3714	131.3000	193.5535	103.7124	265.2343	104.7607	52.7113	26.1192	97.6524	198.7128
13	393.2330	336.1606	268.7796	249.3965	278.5783	324.7175	249.1809	221.3251	253.0525	270.8911
14	430.1418	379.3366	251.1664	299.0405	342.1730	363.0077	289.6511	257.5681	301.4583	330.9164
15	201.6699	129.4160	328.1943	44.4108	126.3922	143.8337	98.3803	117.7443	53.1138	55.9909
16	166.1280	93.6807	324.2884	29.9298	153.6875	111.3583	81.6297	110.2717	34.5661	77.3958
17	319.3734	313.9618	10.2508	298.1501	444.1035	278.7086	248.1816	217.2917	292.9349	387.4866
18	430.3094	381.5320	239.7174	303.6526	353.5162	363.8079	291.4599	258.4165	305.6463	339.6041
19	488.5582	439.1488	283.3727	359.3711	395.2828	421.9465	349.2388	316.5181	361.7866	388.8443
20	415.9781	387.4323	135.5416	335.7202	437.2607	359.1914	302.0124	265.3382	334.1050	401.9290
21	307.3611	296.2399	21.5690	274.2400	416.9014	262.1146	225.9359	153.5945	269.4414	361.7341
22	146.8952	80.7051	278.6835	24.1708	194.7780	81.5126	34.0164	65.7376	15.4878	121.2629
23	28.4987	44.2985	319.7506	138.6770	284.5717	49.1669	123.1691	154.4191	131.2857	208.2341
24	183.7352	131.7729	221.3211	74.5378	226.5709	115.4309	41.5109	15.6368	71.0217	163.2291
25	153.1231	98.6423	241.9384	55.4836	222.2909	84.4076	8.6426	30.0400	48.9370	152.3972
26	127.6931	121.7435	196.2061	143.6203	313.9816	84.8826	89.7724	87.9147	135.3280	241.2476
27	297.7600	291.8871	24.2440	277.4151	425.8323	256.6262	226.8555	196.5797	272.0177	367.7917
28	301.2584	287.1771	35.8638	261.9657	402.9278	253.7362	214.6302	181.5803	257.3910	348.4616
29	257.3960	185.8029	393.9953	115.1645	56.8684	207.8220	169.8229	187.9109	123.5454	20.6860
30	84.2075	98.4321	237.2455	151.6680	320.5107	62.3962	106.1951	118.7159	142.8338	244.5978
31		72.4835	321.4530	165.4357	313.0158	68.7240	144.5767	172.8920	157.7266	236.7260
32	72.4835		313.7174	95.6012	241.9665	37.4574	90.2852	125.4510	88.7406	165.7099
33	321.4530	313.7174		294.7967	438.4531	278.9240	245.7245	214.0180	289.8205	382.9756
34	165.4357	95.6012	294.7967		170.7090	102.8569	55.3328	80.8601	8.8392	97.9197
35	313.0158	241.9665	438.4531	170.7090		264.6757	224.4422	239.2778	179.2902	77.0049
36	68.7240	37.4574	278.9240	102.8569	264.6757		75.8534	105.4540	94.3930	187.8143
37	144.5767	90.2852	245.7245	55.3328	224.4422	75.8534		36.6958	47.8916	153.1324
38	172.8920	125.4510	214.0180	80.8601	239.2778	105.4540	36.6958		75.8480	173.7215
39	157.7266	88.7406	289.8205	8.8392	179.2902	94.3930	47.8916	75.8480		105.9733
40	236.7260	165.2099	382.9756	97.9197	77.0049	187.8143	153.1324	173.7215	105.9733	

581

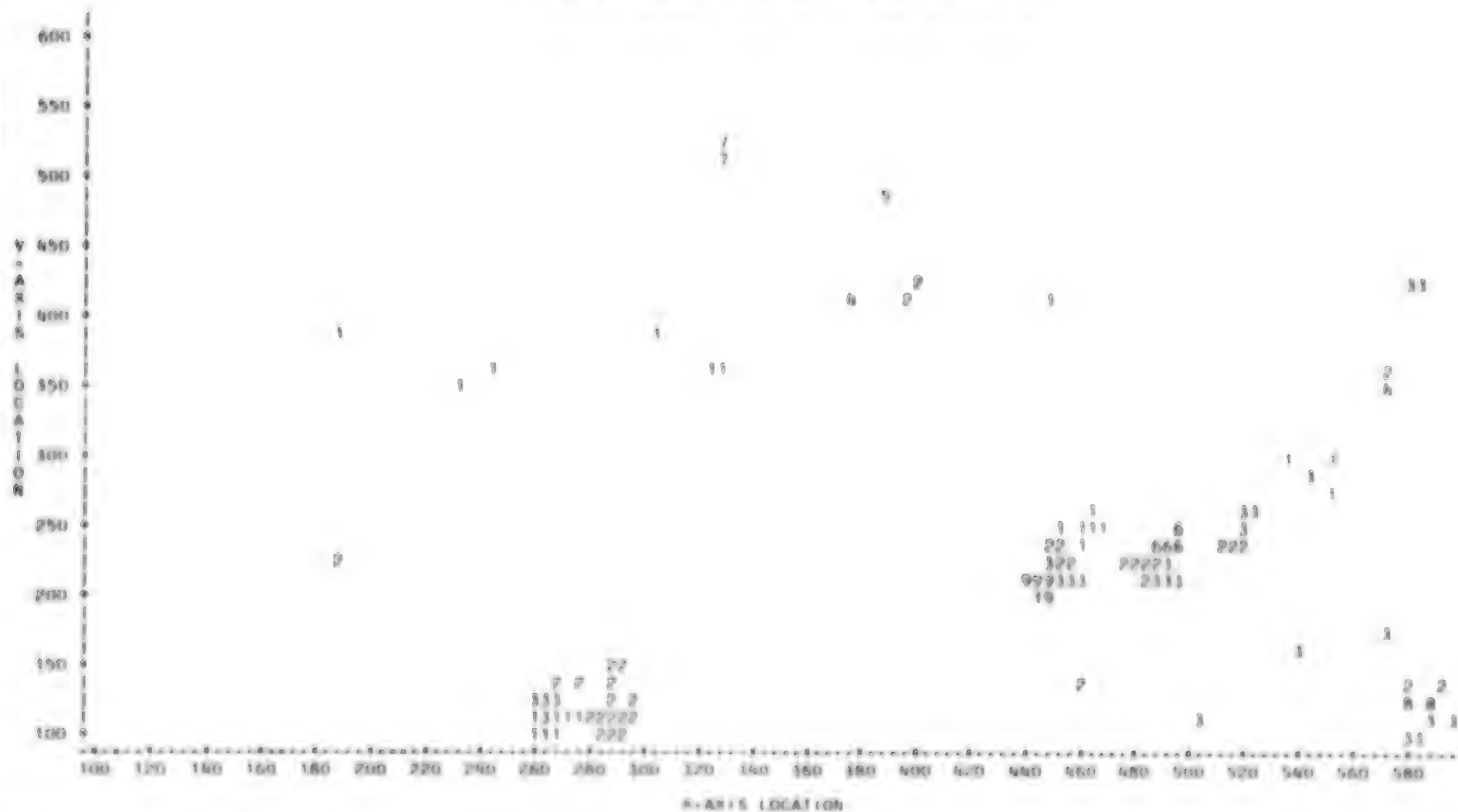
BEST COPY AVAILABLE

581

11:53 THURSDAY, FEBRUARY 25, 1964 19

STEDMAN CULTURAL RESOURCE ASSESSMENT PROJECT
UNIT 17-SPATIAL CLUSTER ANALYSIS

PLOT OF V38*V17 SYMBOL IS VALUE OF CLUSTER



NOTE: 1 OBS HAD MISSING VALUES 210 OBS HIDDEN

282

APPENDIX XIII
Diagnostic Projectile Point Types

This collection of diagnostic projectile point drawings is the result of necessity. In reviewing the over 850 site records for the Seedskadee area which we received from the State Historic Preservation Officer's files in Laramie, it became obvious that many sites were not being dated other than very generally (for example, Middle Prehistoric Period). There appear to be several reasons for this. First, except for Frison's Prehistoric Hunters of the High Plains (1978), there has been no extensive effort in Wyoming to synthesize the various cultural entities found in the archeological record there. Secondly, many of the projectile point types found in the southwestern corner of Wyoming are not Plains types but rather are from the Great Basin and/or the Intermountain-Plateau regions, areas which have also been barely summarized (Butler 1966; Fowler 1968a & b; Heizer & Baumhoff 1961; Jennings 1978).

With that in mind, I started collecting drawings and photographs of diagnostic projectile points which could conceivably be found in the Seedskadee project area. I have tried to remain objective in my selection of examples, my classification of the projectile points, and their dating. The classification of the projectile points has been essentially as the original authors designated them. In philosophy, I am a "splitter". Hence, while the original author may have given a projectile point a general name (for example, Desert Side-notched), if I felt it could be assigned to a previously-designated variety or sub-type (for example, Desert Side-notched, Sierra Variety), I did so. In several rare cases (primarily very early works) where I felt that a projectile point had been mis-identified, I classified it to the best of my judgement. In a few cases where the original author did not classify the points found on their project and I felt that I could confidently identify it, I did so. Dates are as the original authors assigned them. I have used the broadest time spans assigned by various authors.

I would also like to note that, by comparing drawings of projectile points found on the 1981 Seedskadee project survey or the actual points themselves, I was able to identify, with reasonable confidence, 95% of those projectile points.

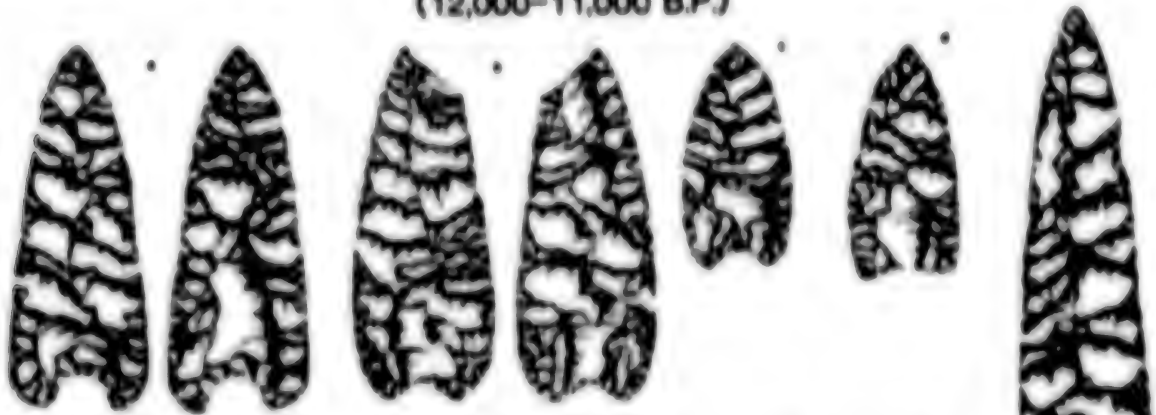
A.K. Ireland

PLAINS TYPOLOGIES

PALEO-INDIAN (12,000-8,000 B.P.)

Clovis

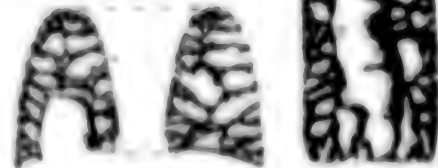
(12,000-11,000 B.P.)



Clovis Site

Folsom
(11,000-10,500 B.P.)

Folsom (fluted)



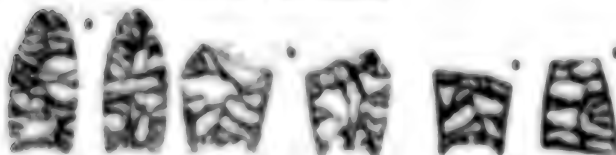
Clovis Site

Agate Site



Clovis Site

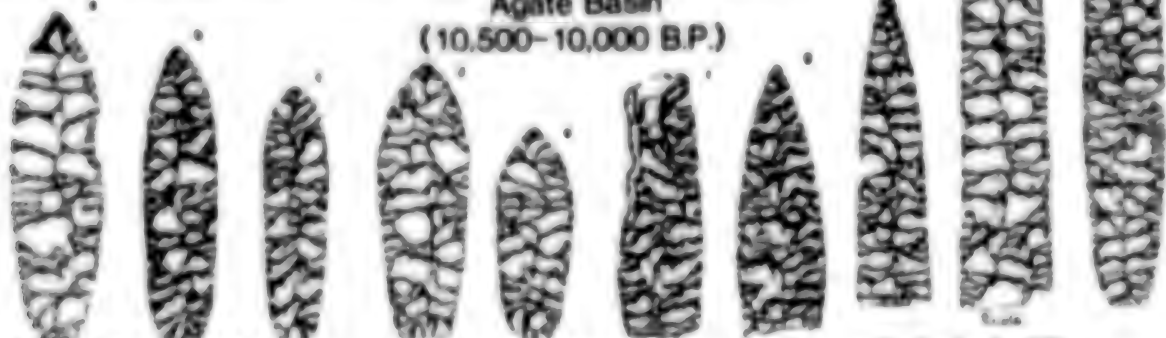
Midland (unfluted)



Clovis Site

Agate Site

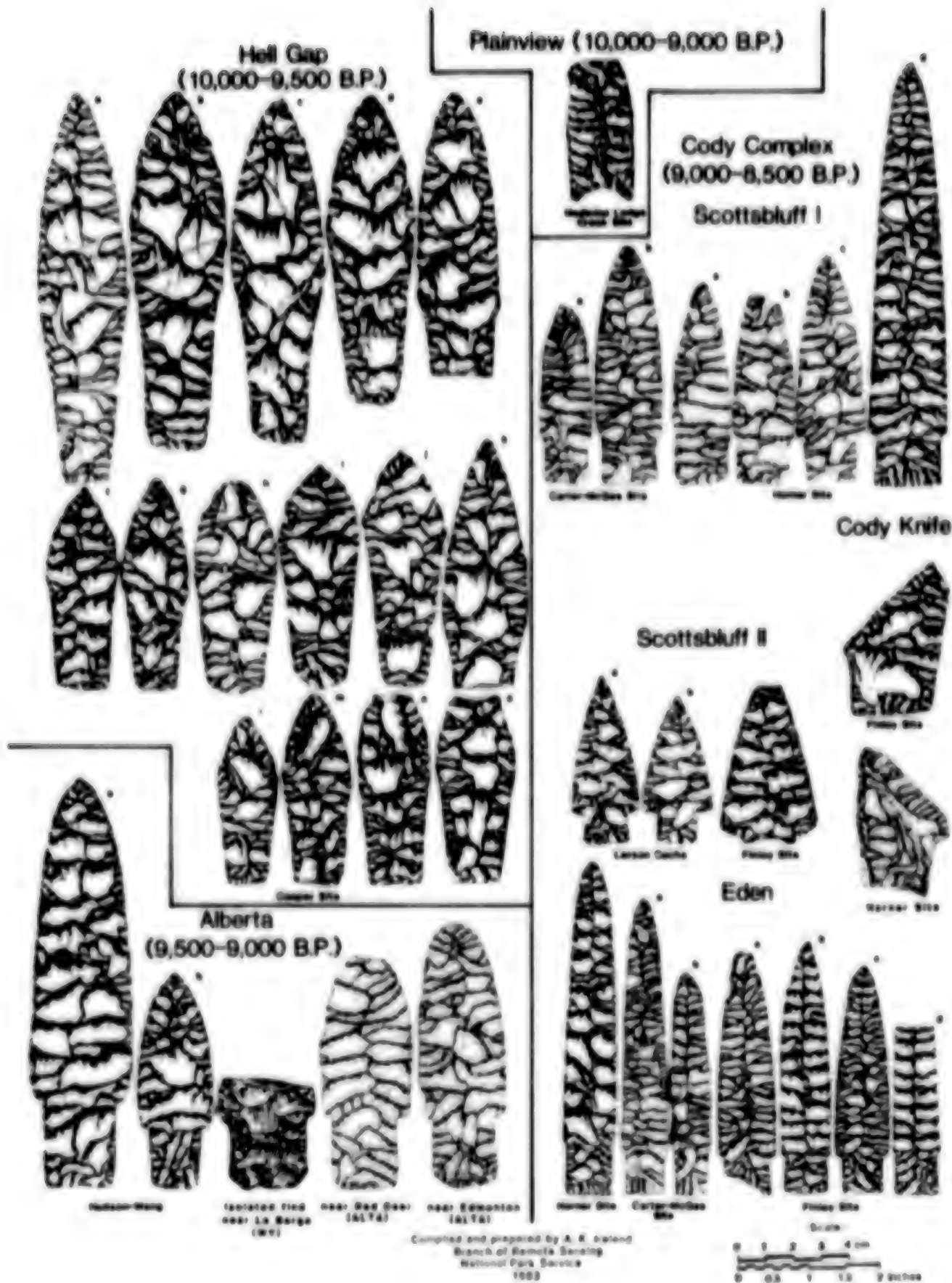
Agate Basin
(10,500-10,000 B.P.)



Agate Basin Site

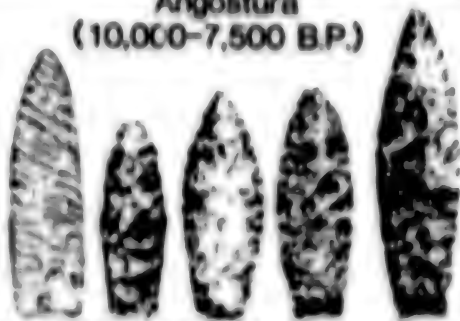
Collected and prepared by A. E. Nelson
Branch of Research Services
National Park Service
1963





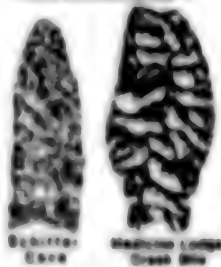
TERMINAL PALEO-INDIAN

Angostura
(10,000-7,500 B.P.)



Lanceolates
(8,500-8,000 B.P.)

Lanceolate I



Schiffen Cave

Medicine Lodge Creek Site

Lanceolate II



Medicine Lodge Creek Site

Schiffen Cave

Split Base & Round Base
(9,600-9,000 B.P.)



Medicine Lodge Creek Site

MOUNTAIN PALEO-INDIAN

Parallel-Oblique
Lanceolate
(8,500-8,000 B.P.)
Pryor Stemmed



Patri Rock V Site

Medicine Lodge Creek Site

Schiffen Cave

Lovell Constricted



Schiffen Cave

Medicine Lodge Creek Site

McKean-like Lanceolate
Terminal Paleo-Indian
(undated)



Schiffen Cave

Medicine Lodge Creek Site

Jimmy Allen (8,400-7,500 B.P.)



Jimmy Allen Site

EARLY PLAINS ARCHAIC
(7,500-5,000 B.P.)

Corner-notched



Schiffen Cave

Wedding of the Waters Cave

Side-notched

Hawken(?)

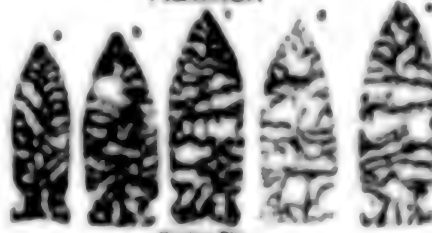


Lookout Site

Ladder Creek Site

Schiffen Cave

Hawken



Hawken Site

Compiled and prepared by A. R. Isom
Branch of Remote Sensing
National Park Service
1980



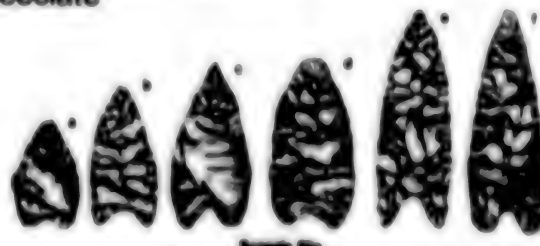
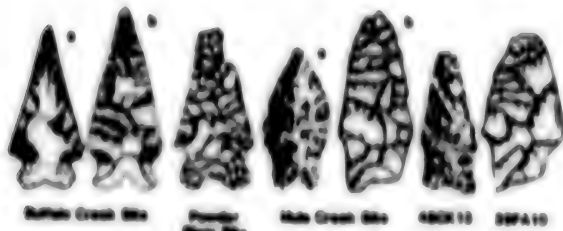
MIDDLE PLAINS ARCHAIC

McKean Techno-Complex (5,000-2,500 B.P.)

Duncan

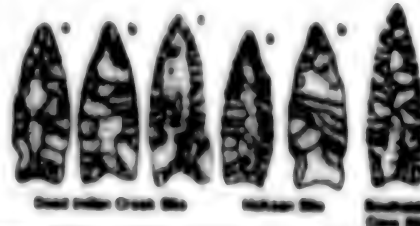
Hanna

Oxbow-like
Variant

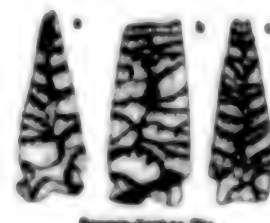


Mallory Side-Notched

McKean Lanceolate
(Southsider Variant)



Yonkee



Reprinted and prepared by G. B. Gifford
Quincy, at Kansas State
Geological Survey



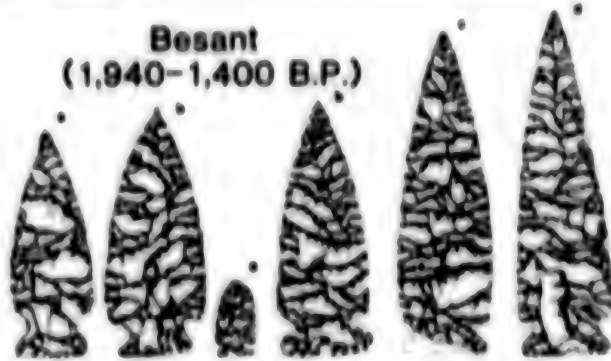
**LATE PLAINS ARCHAIC
(3,100-1,400 B.P.)**

**Pelican Lake
(3,100-1,850 B.P.)**



Medicine Lodge Creek Site

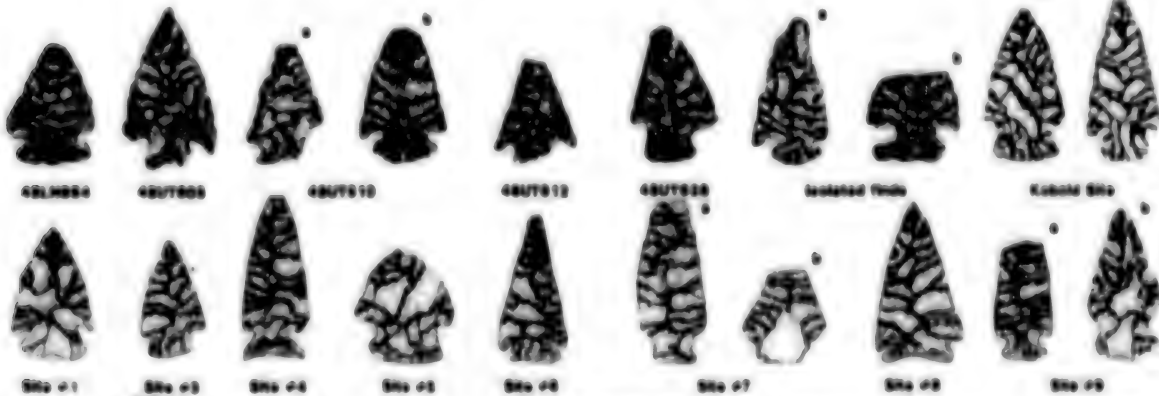
**Besant
(1,940-1,400 B.P.)**



Navy Site

Muddy Creek Site

Large Corner-notched



48LH884

48UT808

48UT810

48UT812

48UT828

Isolated Finds

Kubold Site

Site #1

Site #3

Site #4

Site #5

Site #6

Site #7

Site #8

Site #9

Kilpecker Dune Field



Level II, upper

Level II

Wedding of the Waters Cave

Small Corner-notched



Wedding of the Waters Cave, Level II, lower

Large Side-notched



48LH881

Site #1

Site #2

Wedding of the Waters Cave,

Kilpecker Dune Field Level II, upper

**Large Side-notched,
basally-notched**



Wedding of the Waters Cave,

Level II

Triangular



Wedding of the Waters Cave,

Level II, lower

Compiled and prepared by R. W. Ireland
Branch of Remote Sensing
National Park Service
1983



LATE PLAINS PREHISTORIC-EARLY PLAINS HISTORIC

Avonlea (1,900-1,370 B.P.)



Unnamed Complex



Prairie Side-notched (1,380-600 B.P.)

Nanton Wide Rounded-base Variety Irvine Narrow Square-base Variety



Small Corner-notched

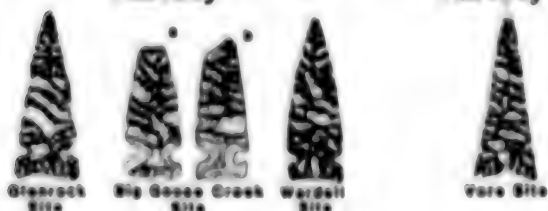


Medium Corner-notched



Plains Side-notched (600-200 B.P.)

Washita Triangular Variety Farson Tri-notched Variety



Billings Double-spur, Basal-notched Variety



Emigrant Basal-notched Variety



Skinny Corner-notched



Small Side-notched



Small Triangular



Large Triangular



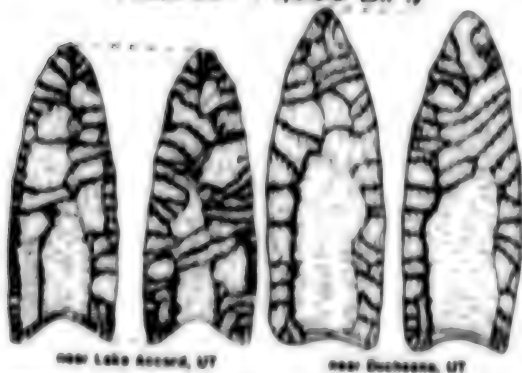
Compiled and prepared by A. R. Wetlund
Branch of Remote Sensing
National Park Service
1969



GREAT BASIN TYPOLOGIES

PALEO-INDIAN (12,000-8,000 B.P.)

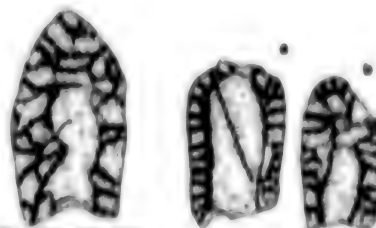
Clovis
(12,000-11,000 B.P.)



near Lago Accord, UT

near Duchesne, UT

Folsom
(11,000-10,500 B.P.)



Silverhorn Site (UT)

near Moab, UT

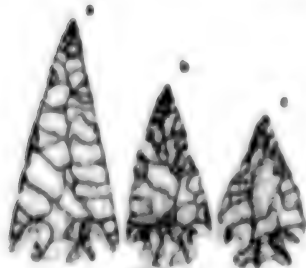
Danger Cave
Lanceolate
(10,500 B.P.)



Danger Cave (UT),
Level Sand 1

TERMINAL PALEO-INDIAN/ARCHAIC ELKO-BITTERROOT SERIES (10,000-500 B.P.)

Elko Corner-notched



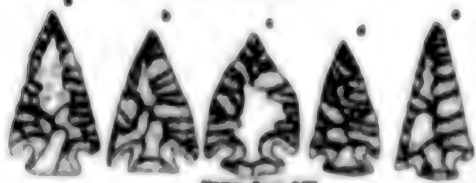
WV EL 11



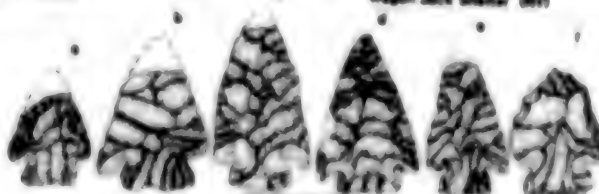
Newark Cave (WV)



Wagon Jack Shelter (WV)



Hogap Cave (UT)

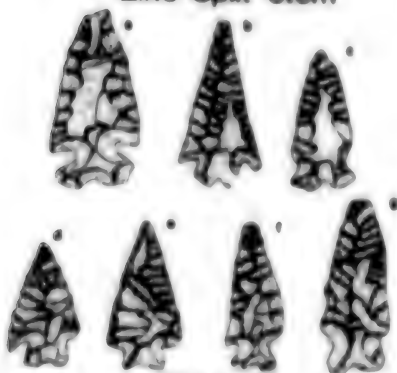


NE Nevada Survey

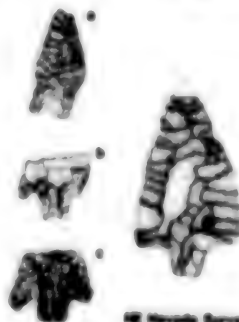
Elko Split-stem

Elko Contracting-stem

Elko Side-notched

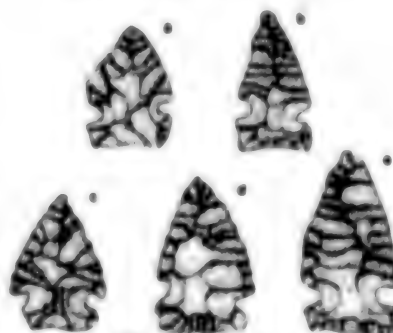


Hogap Cave (UT)



NE Nevada Survey

Wagon Jack Shelter (WV)



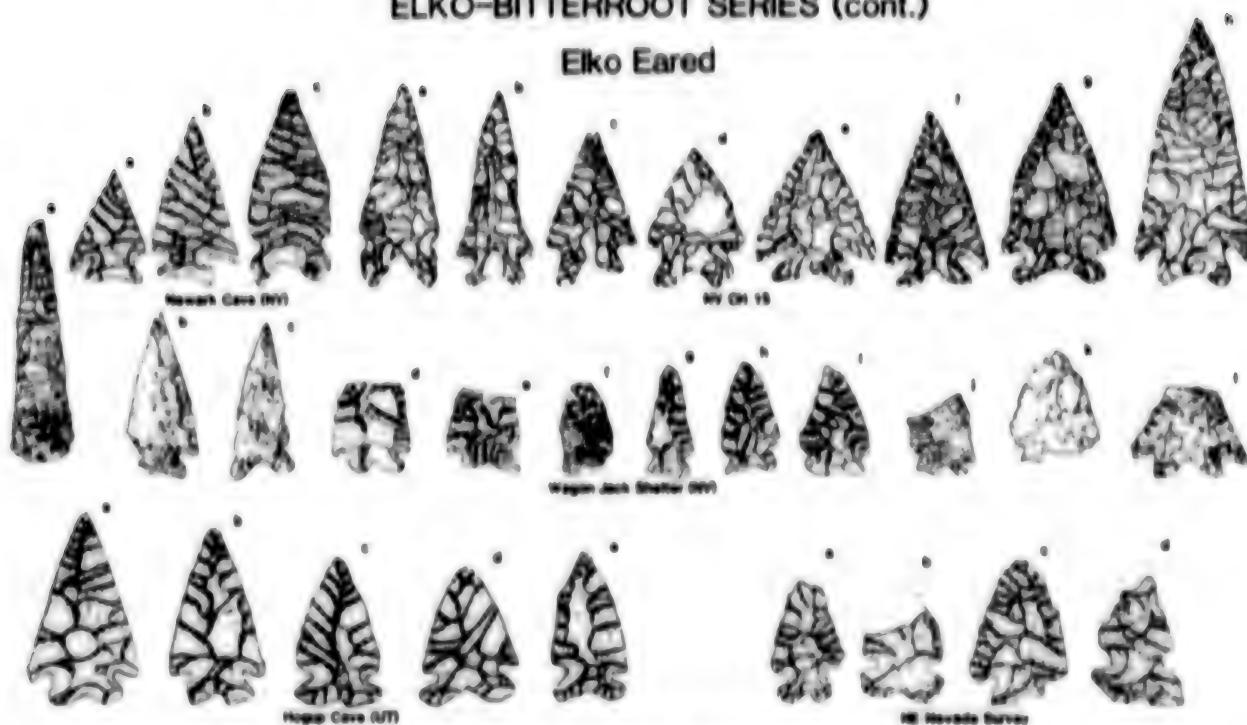
Hogap Cave (UT)

Compiled and prepared by A. R. Ireland
Branch of Remote Sensing
National Park Service
1983

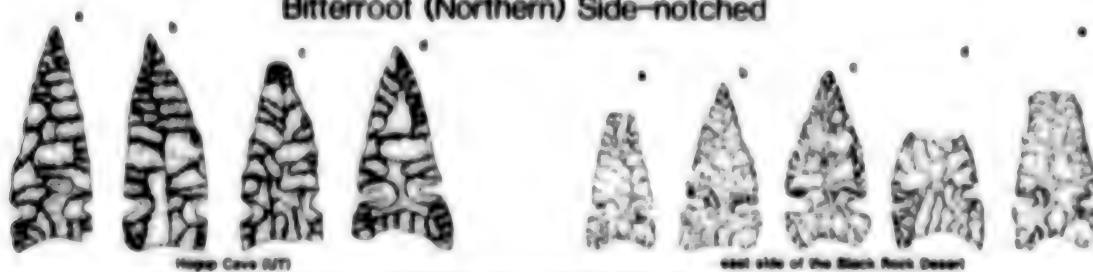
Scale:
0 1 2 3 4 cm
0 0.5 1 1.5 2 inches

ELKO-BITTERROOT SERIES (cont.)

Elko Eared

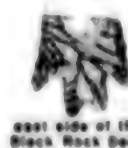


Bitterroot (Northern) Side-notched



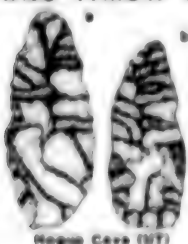
PINTO BASIN SERIES (6,000-3,000 B.P.)

Pinto Barbed



Pinto Shoulderless

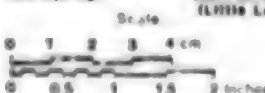
Pinto Willow-leaf



Pinto Square-shoulder

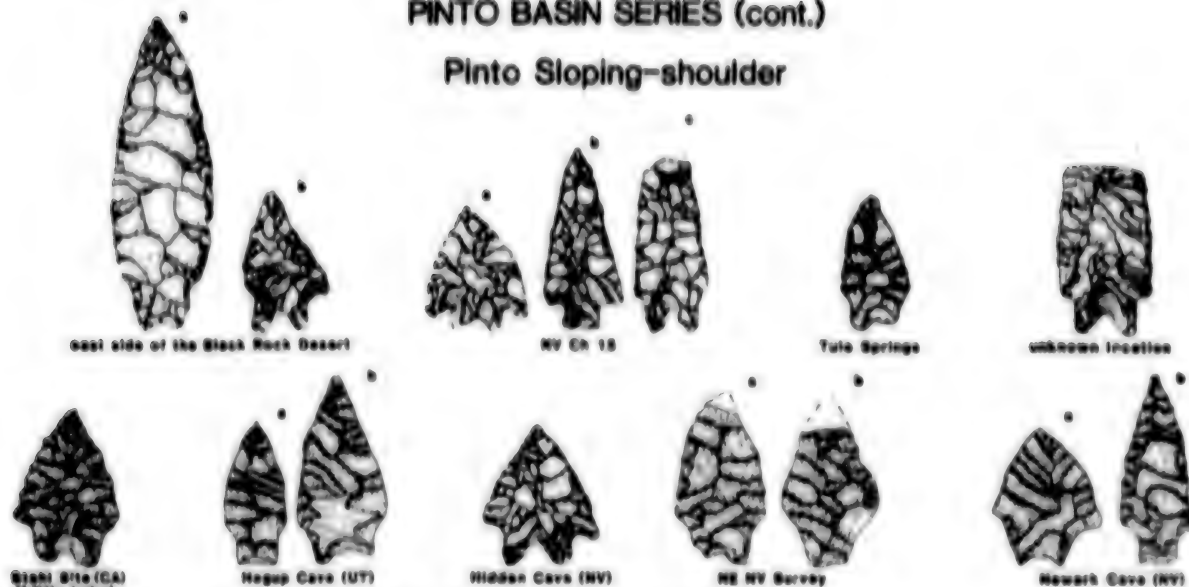


Compiled and prepared by A. R. Ireland
Branch of Remote Sensing
National Park Service
1983



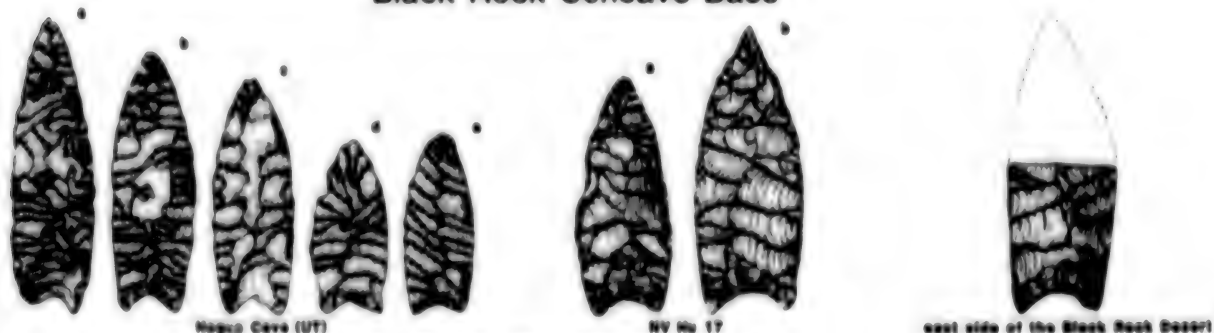
PINTO BASIN SERIES (cont.)

Pinto Sloping-shoulder

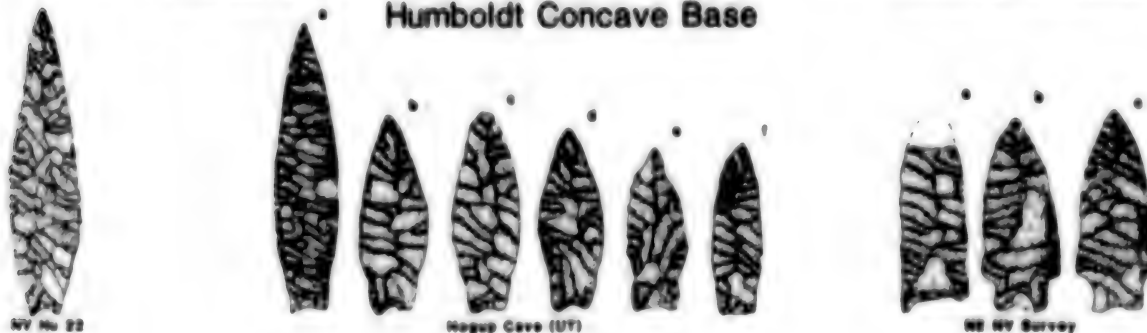


BLACK ROCK-HUMBOLDT SERIES (5,000-3,000 B.P.)

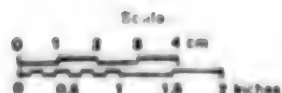
Black Rock Concave Base



Humboldt Concave Base



Compiled and prepared by A. R. Ireland
Branch of Remote Sensing
National Park Service
1983



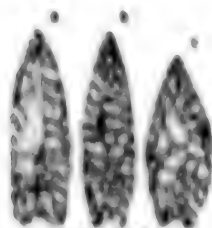
BLACK ROCK-HUMBOLDT SERIES (cont.)

Humboldt Concave Base (cont.)

Humboldt Basal-notched



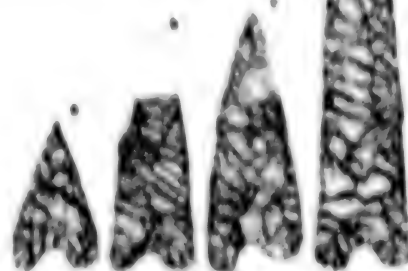
Newark Cave (201)



MV No. 18



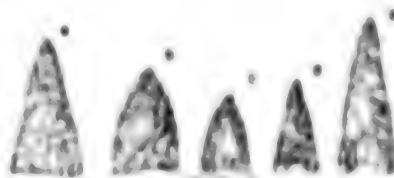
Wagon Jack Shelter (201)



MV No. 18

DESERT COMPLEX (4,000-250 B.P.)

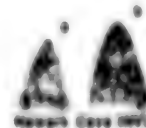
Cottonwood Triangular



MV Ch. 18



ME MV Survey



Newark Cave (201)



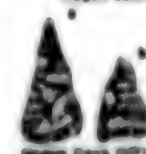
Wagon Jack Shelter (201)



Evans Site (201)

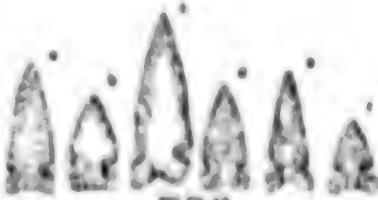


Calwell Village (201)



Hager Cave (201)

Desert Side-notched



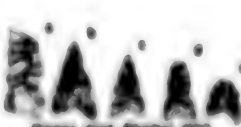
MV Ch. 18



ME MV Survey



Newark Cave (201)



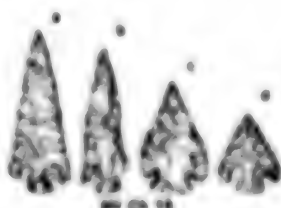
Wagon Jack Shelter (201)



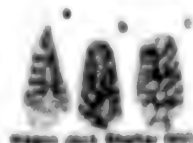
Hager Cave (201)

ROSE SPRING SERIES

Rose Spring Corner-notched



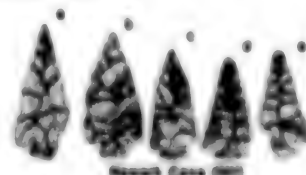
MV Ch. 18



Wagon Jack Shelter (201)



ME MV Survey



Newark Cave (201)



Calwell Village (201)



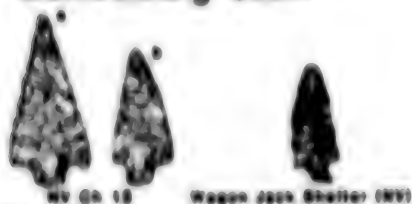
Hager Cave (201)

Compiled and prepared by S. E. Gifford
Branch of Systems Planning
National Park Service
1955



ROSE SPRINGS SERIES (cont.)

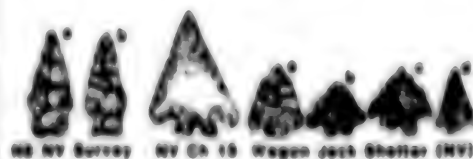
Rose Springs Contracting-stem



Rose Springs Side-notched

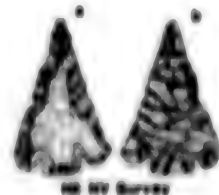


Eastgate Split-stem



EASTGATE SERIES

Eastgate Expanding-stem



FREMONT (1,550-600 B.P.)

Parowan Fremont

Paragonah Phase (900-800 B.P.)

Parowan Basal-notched



Side-notched



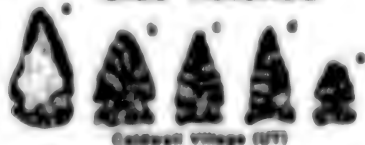
Corner-notched



Uinta Fremont

White Rocks Phase (1,150-1,000 B.P.)

Side-notched



Compiled and prepared by A. E. Isotond
Branch of Remote Sensing
National Park Service
1971



INTER-MOUNTAIN/PLATEAU TYPOLOGIES

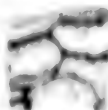
PALEO-INDIAN (12,000-8,000 B.P.)

Clovis
(12,000-11,000 B.P.)



Coyote Flat (OR)

Midland
(unfluted)



National Reactor
Testing Station (OR)
survey

Folsom
(11,000-10,500 B.P.)

Folsom
(fluted)



Leah Channel
Site (ID)



NE Snake River
Floodplain



National Reactor
Testing Station (OR)
survey



Coyote
Flat (OR)



near Enthe
(ID)

Agate Basin
(10,500-10,000 B.P.)



SE Snake River
Floodplain



10-FM-88
(ID)



near Glenn's
Ferry (ID)



Wala Rock-
shelter (ID)

Plainview
(10,000-9,000 B.P.)



10-FM-88 (ID)

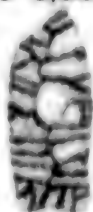


Wala Rockshelter (ID)



10-FM-88 (ID)

Minesand
(9,500-8,500 B.P.)

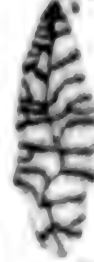
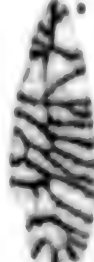


10-OR-134 (ID)

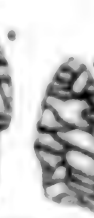
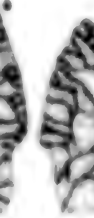
Lind Coulee (12,000-9,000 B.P.)



Lind Coulee Site (WA)

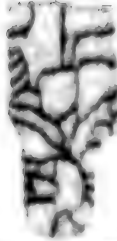


Cooper's Ferry (ID)



unknown location

Alberta
(9,500-9,000 B.P.)



Coyote Flat (OR)



10-TF-88
(ID)



10-TF-108
(ID)



near Jerome
(ID)

Cody Complex
(9,000-8,500 B.P.)

Eden



SW Idaho survey

Scottsbluff I



Coyote Flat (OR)



Completed and prepared by R. E. Goring
Branch of Bureau, Surveying
National Park Service
1963



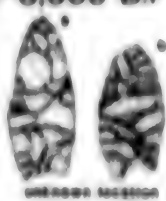
PALEO-INDIAN (cont.)
Birch Creek (9,000-7,000 B.P.)
Windust Phase (10,000-8,000 B.P.)



BLM Eastern District (ID) survey



Wind Creek Site (WA)



unknown location

McKean-like Lanceolate possibly Paleo-Indian (undated)



10-02-88 (ID)



10-TP-81 (ID)

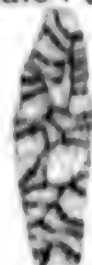


10-TP-128 (ID)

TERMINAL PALEO-INDIAN
possibly Terminal Paleo-Indian Lanceolate I (undated)



10-02-124 (ID)

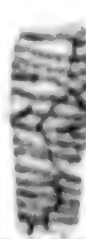


10-TP-14 (ID)



10-02-119 (ID)

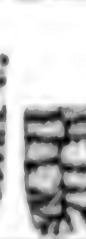
possibly Terminal Paleo-Indian Lanceolate II (undated)



10-TP-88 (ID)



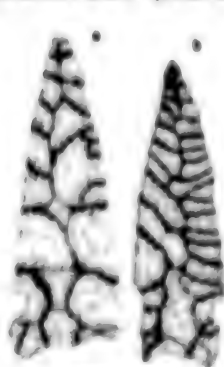
National Reactor Testing Station (ID) survey



TERMINAL PALEO-INDIAN/ARCHAIC
ELKO-BITTERROOT SERIES (9,000-880 B.P.)
Bitterroot (Northern) Side-notched (9,000-3,000 B.P.)



unknown location



10-02-128 (ID)



unknown location



Craters of the Moon National Monument (ID)



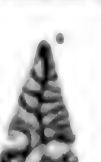
10-02-128 (ID)



Jackknife Cave (ID)



National Reactor Testing Station (ID) survey



Coyote Flat (ID)



Hells Canyon (ID/GR)

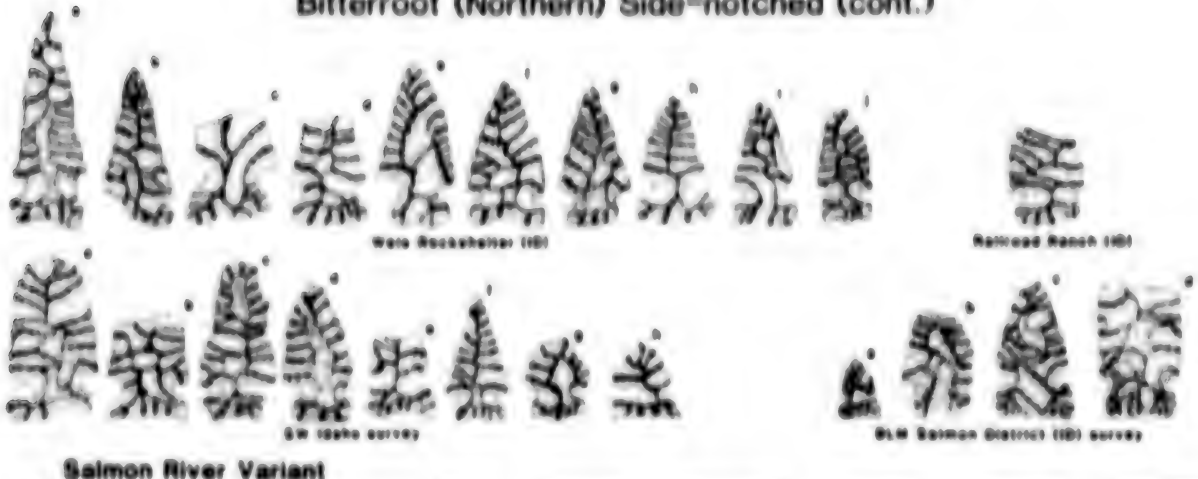


Grave Creek/Rocky Canyon Locality (ID)

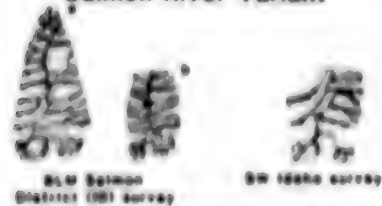
Compiled and prepared by A. E. Ireland
 Branch of Nevada Densification
 National Park Service
 1983



TERMINAL PALEO-INDIAN/ARCHAIC (cont.)
Bitterroot (Northern) Side-notched (cont.)



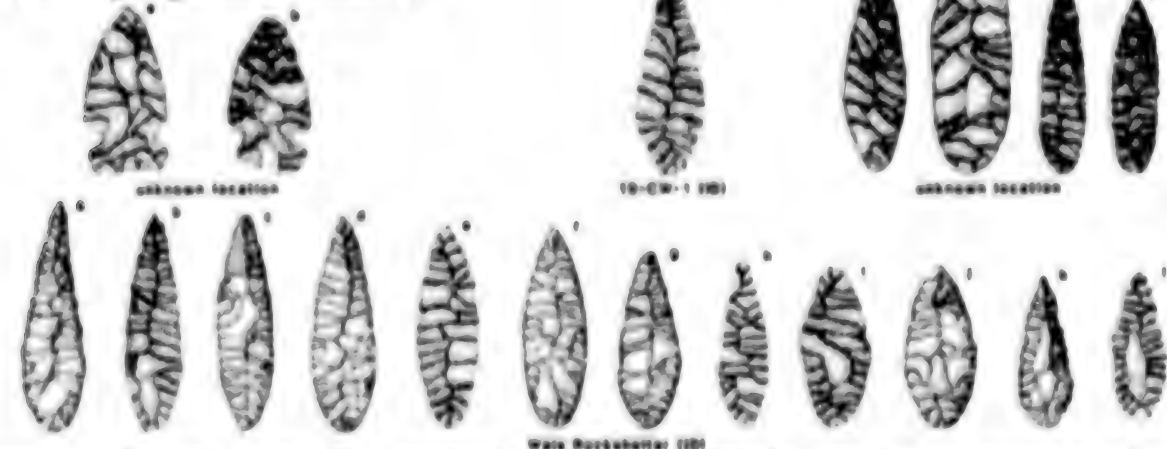
Salmon River Variant



CASCADE PHASE (8,000-5,000 B.P.)

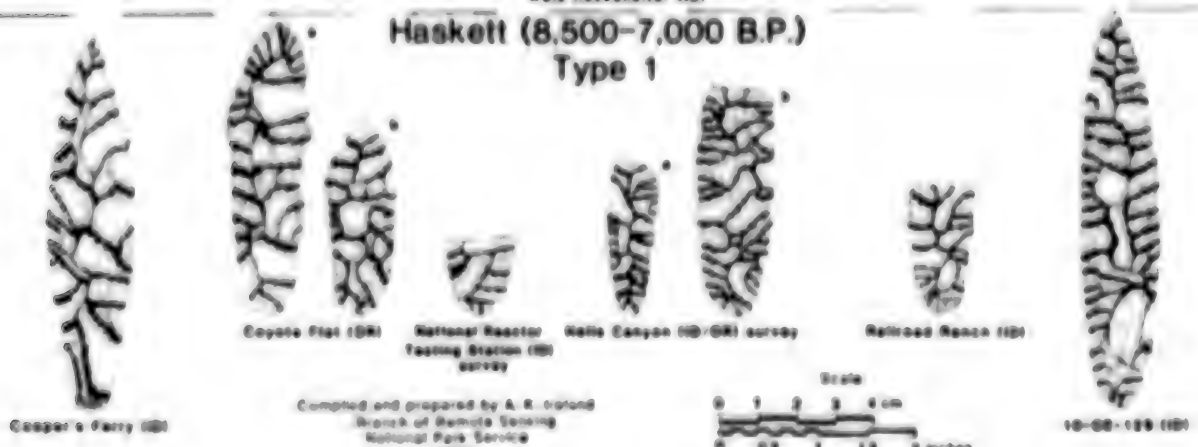
Cascade

Cold Springs Side-notched



HASKETT (8,500-7,000 B.P.)

Type 1



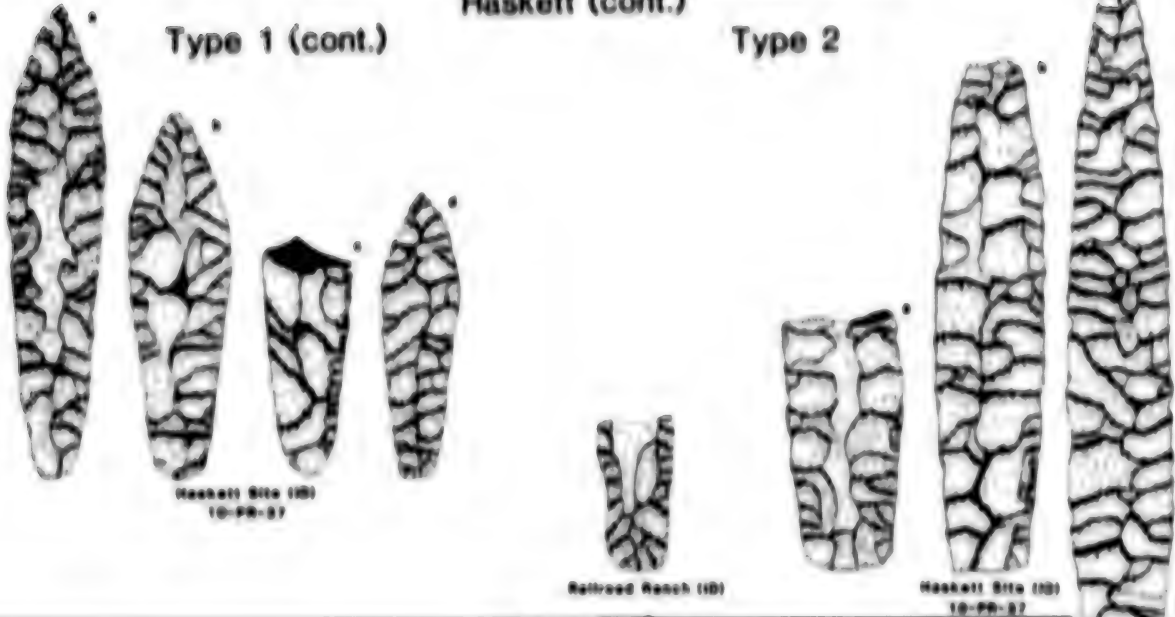
Compiled and prepared by A. R. Gifford
Branch of Remote Sensing
National Park Service
1963



TERMINAL PALEO-INDIAN/ARCHAIC (cont.)
Haskett (cont.)

Type 1 (cont.)

Type 2



Haskett Site (ID)
10-PR-87

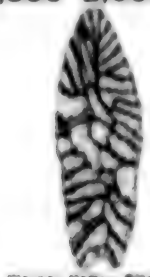
Railroad Ranch (ID)

Haskett Site (ID)
10-PR-87

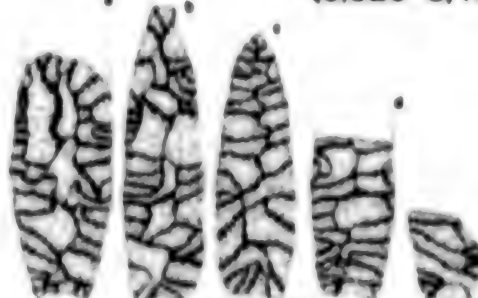
ARCHAIC
BLACK ROCK-HUMBOLDT-MCKEAN-PINTO BASIN SERIES
(7,850-2,500 B.P.)

Black Rock Concave-base
(7,850-2,650 B.P.)

Humboldt Concave-base
(5,920-3,100 B.P.)



Warner Valley Site (DR)



Owl Cave (ID)
10-BY-50



Coyote Flat (DR)

McKean
(5,000-2,500 B.P.)

Humboldt Basal-notch



Wilson Butte Cave (ID)



SW Idaho survey



National Reactor Testing
Station (ID) survey



Coyote Flat (DR)



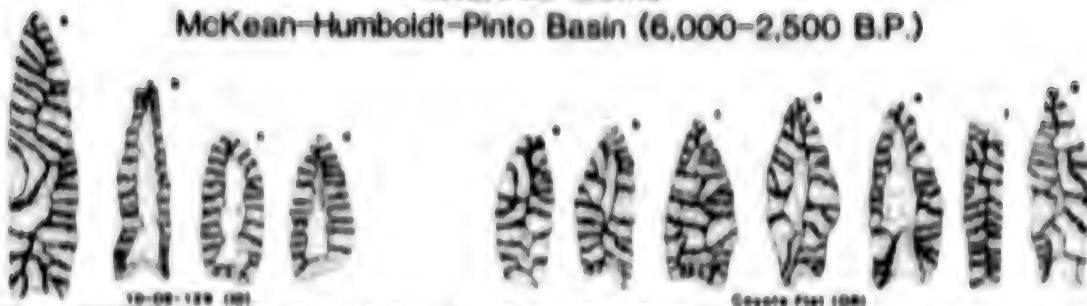
near Glenn's Ferry (ID)

Compiled and prepared by A. R. Ireland
Branch of Remote Sensing
National Park Service
1988



ARCHAIC (cont.)

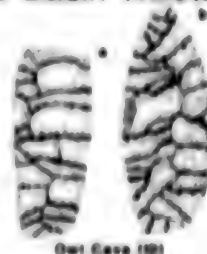
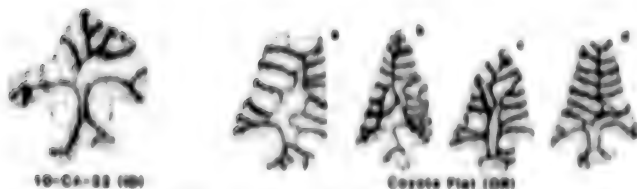
McKean-Humboldt-Pinto Basin (6,000-2,500 B.P.)



Pinto Basin Series (5,300-2,700 B.P.)

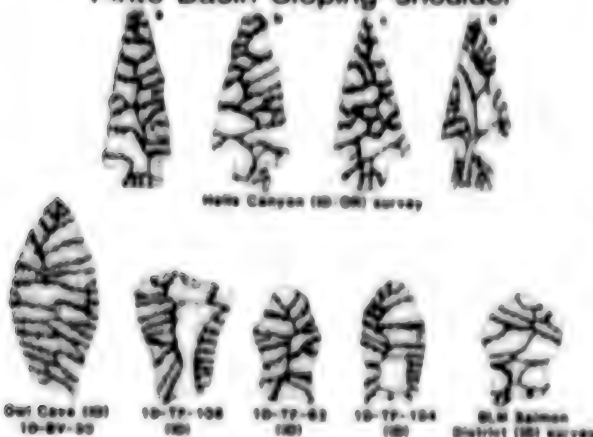
Pinto Basin Barbed

Pinto Basin Willow-leaf



Pinto Basin Sloping-shoulder

Pinto Basin Square-shoulder

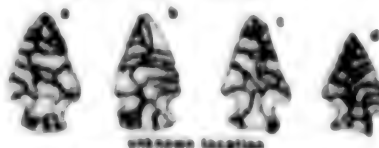


Pinto Basin Shoulderless



TUCANNON PHASE (5,200-2,500 B.P.)

Corner-notched



Contracting-stem

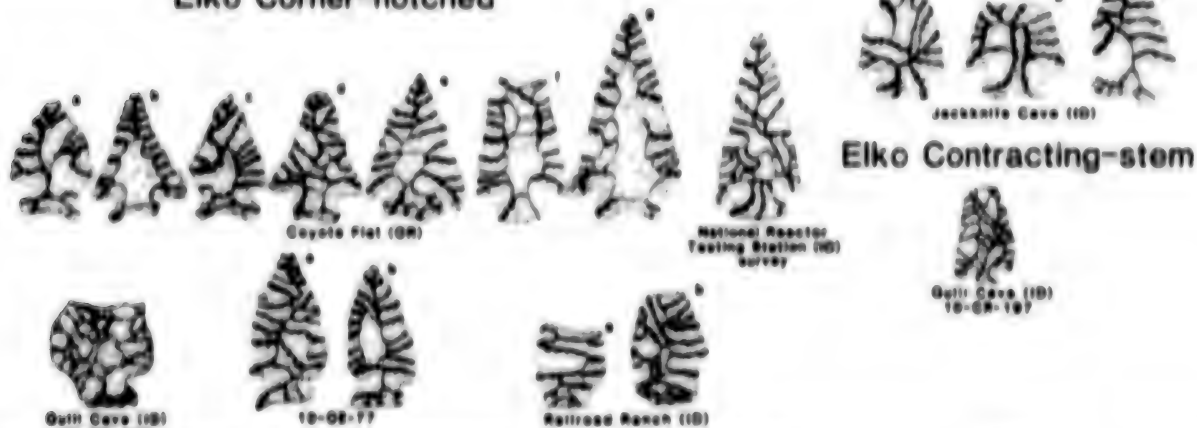


Compiled and prepared by A. K. Ireland
Branch of Remote Sensing
National Park Service
1989

ARCHAIC/LATE PREHISTORIC
Elko Series (4,000-820 B.P.)
Elko Eared



Elko Corner-notched



Elko Contracting-stem



HARDER PHASE (2,500-700 B.P.)

Snake River Corner-notched

early Columbia Valley
Corner-notched



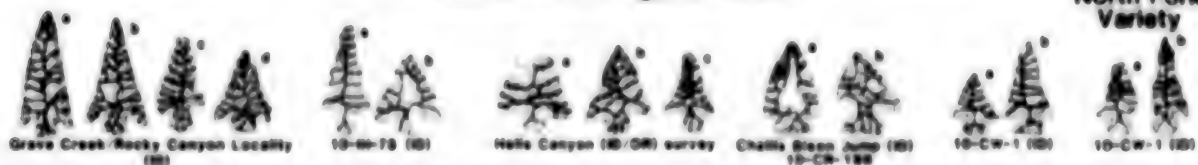
Columbia Valley Corner-notched (600 B.P.-Historic?)

Middle Columbia Basal-notched



Wallula Rectangular-stem

Hermit
Variety



North Fork
Variety

Compiled and prepared by A. R. Ireland
Branch of Remote Sensing
National Park Service
1983



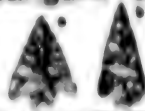
ARCHAIC/LATE PREHISTORIC (cont.)
PIQUIN PHASE (700-250 B.P.)

Middle Columbia Basal-notched



Wapinitum Site (WA)

Wallula
Rectangular-stem



Wapinitum Site (WA)

Side-notched



Wapinitum Site (WA)

DESERT COMPLEX

Desert Side-notched (1,250 B.P.-Historic)

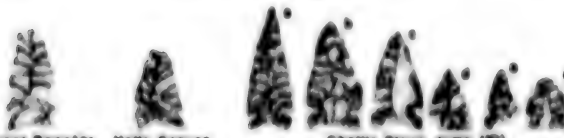
General Variety



BLM Salmon District (ID) survey

Challis Basin Jump (ID)
10-CN-198

Redding Variety



National Reactor
Testing Station (ID) survey

Hells Canyon (ID/OR) survey

Challis Basin Jump (ID)
10-CN-198

Sierra Variety



Challis Basin Jump (ID)
10-CN-198

National Reactor
Testing Station (ID) survey

Wilson Butte
Cave (ID)

Craters of the
Moon National
Monument (ID)

Delta Variety



Challis Basin Jump (ID)
10-CN-198



SW Idaho survey

Cottonwood
Triangular
(1,050 B.P.-Historic)



National Reactor
Testing Station (ID) survey

Eastgate Series
(1,450 B.P.-Historic)

Eastgate
Expanding-stem



Hells Canyon (ID/OR) survey

Eastgate
Split-stem



Hells Canyon (ID/OR) survey

Avonlea
(1,900-600 B.P.)



National Reactor
Testing Station (ID) survey

Compiled and prepared by A. R. Island
Branch of Remote Sensing
National Park Service
1983



BIBLIOGRAPHIC SOURCES FOR THE PROJECTILE POINT DRAWINGS AND DATES

PLAINS SEQUENCES

Clovis	Frison 1978
Folsom	Frison 1978
Midland	Frison 1978
Agate Basin	Frison 1978
Hell Gap	Frison 1978
Plainview	Frison 1978
Alberta	Frison 1978, Wormington 1957, Reynolds 1983
Cody Complex	
Cody Knife	Frison 1978, Jennings 1974
Scottsbluff I	Frison 1978
Scottsbluff II	Frison 1978
Eden	Frison 1978
Angostura	Wormington 1957, Jennings 1974
Mountain Paleo-Indian	
Split/Round Base	Frison 1978
Pryor Stemmed	Frison 1978
Lovell Constricted	Frison 1978
Terminal Paleo-Indian	
Lanceolate I	Frison 1978
Lanceolate II	Frison 1978
McKean-like Lanceolate	Frison 1978
Jimmy Allen	Mulloy 1959, Frison 1978
Early Plains Archaic	
Corner-notched	Frison 1978
Hawken	Frison 1978
Duncan	Wheeler 1954, Jennings 1974, Ziemens & Walker 1977a & 1977b, Frison 1978
Hanna	Wheeler 1954, Jennings 1974, Frison 1974
Oxbow Variant	Breckenridge 1974
McKean Lanceolate	Frison, Wilson, & Wilson 1974, Ziemens & Walker 1977a & 1977b, Frison 1978
McKean Lanceolate (South-sider Variant)	Frison 1978
Yonkee	Frison, Wilson, & Wilson 1974, Frison 1978
Pelican Lake	Ziemens & Walker 1977a & 1977b, Frison 1978
Besant	Frison 1978
Late Plains Archaic	
Small Corner-notched	Frison 1962
Large Corner-notched	Frison 1962 & 1978, Ahlbrandt 1974, Zier & Peebles 1982
Large Side-notched	Frison 1962, Ahlbrandt 1974, Zier & Peebles 1982
Large Side-notched, Basal-notched	Frison 1962
Triangular	Frison 1962
Avonlea	Kehoe & McCorquodale 1961, Ahlbrandt 1974, Ziemens & Walker 1977a & 1977b, Frison 1978
Prairie Side-notched	
Nanton variety	Kehoe 1967, Frison 1978
Irvine variety	Kehoe 1967, Frison 1978

Plains Side-notched	
Washita Triangular	Kehoe 1967, Siemens & Walker 1977a & 1977b, Frison 1978
Washita Tri-notched	Kehoe 1967, Frison 1978
Billings Double-spur, Basal-notched	Kehoe 1967, Frison 1978
Emigrant Basal-notched	Kehoe 1967, Frison 1978
Late Prehistoric/Early Historic	
Unnamed Complex	Frison 1978
Small Corner-notched	Ahlbrandt 1974, Zier & Peebles 1982
Medium Corner-notched	Ahlbrandt 1974, Zier & Peebles 1982
Skinny Corner-notched	Ahlbrandt 1974
Small Side-notched	Ahlbrandt 1974
Small Triangular	Frison 1962
Large Triangular	Ahlbrandt 1974, Frison 1978

GREAT BASIN SEQUENCES

Clovis	Crouse 1954, Tripp 1966,
Folsom	Gunnerson 1956, Hunt & Tanner 1960
Danger Cave Lanceolate	Jennings 1978
Elko-Bitterroot Series	
Elko	
Corner-notched	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Split-stem	Jennings 1978
Contracting-stem	Heizer & Baumhoff 1961, Fowler 1968a
Side-notched	Jennings 1978
Eared	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Bitterroot (Northern)	
Side-notched	Heizer & Hester 1978, Jennings 1978
Pinto Basin Series	
Barbed	Wormington 1957, Fowler 1968b, Heizer & Hester 1978, Jennings 1978
Shoulderless	Jennings 1978
Willow-leaf	Jennings 1978
Square-shoulder	Wormington 1957, Heizer & Hester 1978, Jennings 1978
Sloping-shoulder	Wormington 1957, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Black Rock-Humboldt Series	
Black Rock Concave Base	Heizer & Hester 1978, Jennings 1978
Humboldt Concave Base	Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Humboldt Basal-notched	Heizer & Baumhoff 1961, Heizer & Hester 1978
Desert Complex	
Cottonwood Triangular	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Desert Side-notched	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978

Rose Springs Series	
Corner-notched	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978, Jennings 1978
Expanding-stem	Jennings 1978
Contracting-stem	Heizer & Baumhoff 1961, Heizer & Hester 1978
Side-notched	Jennings 1978
Eastgate Series	
Expanding-stem	Heizer & Baumhoff 1961, Fowler 1968a & 1968b, Heizer & Hester 1978
Split-stem	Heizer & Baumhoff 1961, Fowler 1968a, Heizer & Hester & Hester 1978
Premont	
Paragonah Phase	
Parowan Basal-notched	Jennings 1978
Side-notched	Jennings 1978
Corner-notched	Jennings 1978
White Rocks Phase	
Side-notched	Jennings 1978

PLATEAU-INTERMOUNTAIN SEQUENCES

Clovis	Butler 1970a
Folsom	Campbell 1956, Swanson 1961, Butler 1970a & 1970b
Midland	Butler 1970b
Agate Basin	Kehoe 1955, Swanson 1961, Butler 1962, Swanson & Ranere 1970
Plainview	Butler 1962, Swanson & Ranere 1970
Milnesand	Swanson <u>et al.</u> 1964b
Alberta	Swanson 1961, Swanson <u>et al.</u> 1964b, Butler 1970a
Cody Complex	
Scottsbluff I	Butler 1970a
Eden	Swanson 1961
Lind Coulee	Daugherty 1956, Butler 1969, Leonhardy & Rice 1970
Birch Creek	
Type A	Butler 1966
Type B	Swanson <u>et al.</u> 1969
Windust Phase	Daugherty 1956, Leonhardy & Rice 1970
Terminal Paleo-Indian	
Lanceolate I	Swanson <u>et al.</u> 1964b, Butler 1970b
Lanceolate II	Swanson <u>et al.</u> 1964b
McKean-like Lanceolate	Warren <u>et al.</u> 1968
Elko-Bitterroot Series	
Bitterroot (Northern)	
Side-notched	Butler 1962, 1966, 1970a & 1970b, Gruhn 1964, Swanson <u>et al.</u> 1964b, Sneed 1967, Warren <u>et</u> <u>al.</u> 1968, Swanson <u>et al.</u> 1969, Swanson & Sneed 1969, Swanson & Sneed 1971
Salmon River variant	Swanson <u>et al.</u> 1964b, Swanson <u>et al.</u> 1969

Cascade Phase	
Cascade Point	Butler 1962 & 1966, Lynch <u>et al.</u> 1965, Leonhardy & Rice 1970
Cold Springs Side- notched	Leonhardy & Rice 1970
Haskett	
Type 1	Gruhn 1964, Butler 1965, 1967, 1969, 1970a & 1970b, Warren <u>et al.</u> 1968, Swanson & Ranere 1970
Type 2	Butler 1965, Swanson & Sneed 1969
Black Rock-Humboldt-McKean-Pinto Basin Series	
Black Rock Concave Base	Weide & Weide 1969
Humboldt Concave Base	Butler 1968 & 1970a
Humboldt Basal-notched	Kehoe 1955, Butler 1970a
McKean Lanceolate	Gruhn 1961a, Swanson <u>et al.</u> 1964b, Butler 1966
McKean-Humboldt-Pinto Basin	Gruhn 1964, Butler 1970a
Pinto Basin	
Barbed	Swanson <u>et al.</u> 1964b, Butler 1970a
Shoulderless	Butler 1970a
Willow-leaf	Butler 1968
Square-shoulder	Swanson <u>et al.</u> 1969, Butler 1970a, Swanson & Ranere 1970
Sloping-shoulder	Swanson <u>et al.</u> 1964b, Butler 1968 & 1970a, Warren <u>et al.</u> 1968, Swanson <u>et al.</u> 1969
Tucannon Phase	
Corner-notched	Leonhardy & Rice 1970
Contracting-stem	Leonhardy & Rice 1970
Elko-Bitterroot Series (cont.)	
Elko	
Corner-notched	Swanson <u>et al.</u> 1964b, Swanson & Sneed 1969, Butler 1970a, 1970b & 1971
Contracting-stem	Butler 1971
Eared	Butler 1970a & 1970b
Harder Phase	
Snake River Corner- notched	Leonhardy & Rice 1970
early Columbia Valley Corner-notched	Warren 1968, Leonhardy & Rice 1970
Avonlea	Butler 1970b
Desert Complex	
Cottonwood Triangular	Butler 1970b
Desert Side-notched	
General variety	Swanson <u>et al.</u> 1969, Butler 1971
Redding variety	Warren <u>et al.</u> 1968, Butler 1970b & 1971
Sierra variety	Gruhn 1961a, Butler 1966, 1970b & 1971, Sneed 1967
Delta variety	Swanson <u>et al.</u> 1964, Butler 1971
Eastgate Series	
Expanding-stem	Warren <u>et al.</u> 1968
Split-stem	Warren <u>et al.</u> 1968

Piquin Phase

unnamed side-notched	Leonhardy & Rice 1970
Columbia Valley Corner-notched	
Middle Columbia Basal-notched	Warren 1968, Lynch <u>et al.</u> 1965, Gaarder 1967, Warren <u>et al.</u> 1968, Leonhardy & Rice 1970
Hermit variety	Lynch <u>et al.</u> 1965
Wallula Rectangular-stem	Butler 1966 & 1971, Gaarder 1967, Leonhardy & Rice 1970
North Fork variety	Lynch <u>et al.</u> 1965

APPENDIX XIV
1983 Field Survey Sample Unit Locations

BLANK

PAGE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
Survey Unit/Site Locational Data

Smithsonian Number	Survey Unit	County	USGS Topo Sheet	Town- ship	Range	Section	Sub-sections	UTMs (NE and SW corners)
48LN1297	1	LN	Fontenelle Reservoir SE	24N	112W	26	SE1/4 of NE1/4 N1/2 of SE1/2	4654000mN 576000mE 4653500mN 575500mE
48SW5820	2	SW	Gasson Bridge	23N	108W	14 15	W1/2 of NW1/4 NE1/4	4647770mN 613000mE 4647270mN 612500mE
48SW5821	3	SW	Gasson Bridge	23N	108W	22 27	SE1/4 of SW1/4 SW1/4 of SE1/4 NE1/4 of NW1/4 NW1/4 of NE1/4	4645000mN 613500mE 4644500mN 613000mE
48SW5822	4	SW	McCullen Bluff	23N	110W	9 16	S1/2 of SE1/4 NE1/4	4648000mN 592500mE 4647500mN 592000mE
48SW5823	5	SW	Gasson Bridge	23N	109W	13 14 23 24	SW1/4 of SW1/4 of SW1/4 SE1/4 of SE1/4 NE1/4 of NE1/4 W1/2 of NW1/4 of NW1/4	4646500mN 605500mE 4646000mN 605000mE
48SW5824	6	SW	Gasson Bridge	23N	108W	32	W1/2 of NW1/4 of NE1/4 W1/2 of SW1/4 of NE1/4 NW1/4	4643000mN 609500mE 4642500mN 609000mE
48SW5825	7	SW	Blue Forest Twelvemile Sink	24N	110W	22	all of NE1/4	4655500mN 593500mE 4655000mN 593000mE
48SW5826	8	SW	Blue Forest Twelvemile Sink	24N	110W	27	S1/2 of NE1/4 SE1/4 of NW1/4 SE1/4 NE1/4 of SW1/4	4653500mN 593500mE 4653000mN 593000mE

BEST COPY AVAILABLE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
Survey Unit/Site Locational Data (cont.)

Smithsonian Number	Survey Unit	County	USGS Topo Sheet	Town- ship	Range	Section	Sub-section	UTMs (NE and SW corners)
48SW5827	9	SW	McCullen Bluff	22N	110W	3	W1/2 of SW1/4	4640500mN 593000mE
						4	E1/2 of SE1/4	4640000mN 592500mE
48SW5828	10	SW	Thoman School Twelvemile Sink	23N	109W	4	E1/2 of NW1/4 SW1/4	4650500mN 601000mE
								4650000mN 600000mE
not done	11	SW	Lombard Buttes	21N	109W	21	NW1/4 of SW1/4 E1/2 of NE1/4	4626500mN 602500mE
								4626000mN 602000mE
48SW5829	12	SW	Lombard Buttes	21N	110W	24	SE1/4	4626000mN 597500mE
								4625500mN 597000mE
48SW5830	13	SW	Stevens Flat	20N	109W	34	E1/2 of NW1/4 W1/2 of NE1/4	4614500mN 608500mE
								4614000mN 608000mE
48SW5831	14	SW	McCullen Bluff	23N	111W	14	NW1/4	4647500mN 585500mE
								4647000mN 585000mE
48SW5832	15	SW	Twelvemile Sink	24N	110W	24	SW1/4 of SE1/4 SE1/4 of SW1/4	4654500mN 596000mE
						25	NE1/4 of NW1/4 NW1/4 of NE1/4	4654000mN 595500mE
48SW5833	16	SW	Peru Austin Ranch	19N	108W	16	E1/2 of SW1/4 SE1/4	4609000mN 616500mE
								4608500mN 616000mE
48SW5834	17	SW	Casson Bridge Big Island Bridge	22N	108W	14	SW1/4	4637000mN 614000mE
						15	E1/2 of E1/2 of SE1/4	4636500mN 613500mE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
Survey Unit/Site Locational Data (cont.)

Smithsonian Number	Survey Unit	County	USGS Topo Sheet	Town- ship	Range	Section	Sub-section	UTMs (NE and SW corners)
not done	18	SW	Peru	19N	108W	28	SW1/4 of SE1/4 SE1/4 of NW1/4 of SE1/4 E1/4 of SE1/4 of SW1/4	4606000mN 616500mE 4605500mN 616000mE
48SW5388	19	SW	Blue Point	20N	109W	30	SW1/4 of NW1/4 NW1/4 of SW1/4	4615500mN 603000mE 4615000mN 602500mE
				20N	110W	25	SE1/4 of NE1/4 NE1/4 of SE1/4	
48SW5835	20	SW	Lombard Buttes	22N	109W	21	S1/2 of NE1/4 N1/2 of SE1/4	4636000mN 602500mE 4635500mN 602000mE
						22	SW1/4 of NW1/4 NW1/4 of SW1/4	
48SW5836	21	SW	McCullen Bluff	22N	111W	14	SW1/4 of NE1/4 SE1/4 of NW1/4 NW1/4 of SE1/4 NE1/4 of SW1/4	4637500mN 586000mE 4637000mN 585500mE
48SW5837	22	SW	Thoman School	23N	110W	24	NW1/4 of SE1/4 of SW1/4 W1/2 of NE1/4 of SW1/4 E1/2 of NW1/4 of SW1/4 E1/2 of W1/2 of NW1/4 of SW1/4 N1/2 of SW1/4 of SW1/4	4645500mN 596500mE 4645000mN 596000mE
48SW5838	23	SW	Fontenelle	23N	111W	20	W1/2 of SW1/4 of NE1/4 SE1/4 of NW1/4 W1/2 of NW1/4 of SE1/4 NE1/4 of SW1/4	4646000mN 580500mE 4645500mN 580000mE

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT
Survey Unit/Site Locational Data (cont.)

Smithsonian Number	Survey Unit	County	USGS Topo Sheet	Town- ship	Range	Section	Sub-sections	UTMs (NE and SW corners)
48SW5839	24	SW	Thoman School	23N	109W	5	SW1/4 of SW1/4 of SW1/4	4649500mN 599000mE
						6	S1/2 of SE1/4	4649000mN 598500mE
						7	NE1/4 of NE1/4	
						8	W1/2 of NW1/4 of NW1/4	
48SW5696	25	SW	Stevens Flat	19N	109W	4	W1/2 of SW1/4 of NE1/4	4612500mN 606500mE
							N1/2 of SW1/4	4612000mN 606000mE
							S1/2 of NW1/4	
48LN1298	26	LN	Fontenelle	23N	111W	19	S1/4 of SE1/4	4645000mN 579500mE
48SW5840	26	SW					E1/2 of SE1/4 of SW1/4	4644500mN 579000mE
						30	N1/2 of NE1/4	
							NE1/4 of NE1/4 of NW1/4	
not done	27	SW	Whiskey Buttes	22N	110W	28	S1/2 of NW1/4 of SE1/4	4634000mN 592500mE
							N1/2 of SW1/4 of SE1/4	4633500mN 592000mE
							N1/2 of S1/2 of SW1/4 of SE1/4	
48SW5841	28	SW	Casson Bridge	23N	108W	7	SW1/4 of SW1/4 of SW1/4 of SW1/4	4648000mN 609000mE
						8	S1/2 of S1/2 of SW1/4	4647600mN 608500mE
						18	E1/2 of NE1/4 of NE1/4 of NE1/4	
							E1/2 of SE1/4 of NE1/4 of NE1/4	
						17	NW1/4 of NW1/4	

APPENDIX XV

Previous Archeological Clearance Surveys in the Seedskadee Area

SEEDSKADEE REGION--Previous Surveys

USGS 7.5' Quadrangle Map Wyoming SHPO's Survey Report Numbers

Names Hill	800248, 820395
Anderson Canyon	801870, 810455, 812383
Monument Butte	780918, 801870, 810455, 812028, 812029, 812031, 820350
Monument Butte NE	801870, 802158
Twelvemile Knoll	802158
Fourmile Knoll	812318
Fontenelle Reservoir SW	800309, 801014
Fontenelle Reservoir SE	780918, 790247, 790363, 800269, 800943, 801035, 801870, 810455, 820753
Blue Forest	780918, 790585, 791307, 800084, 800269, 800843, 800896, 801870, 820135, 820194
Twelvemile Sink	-----
Simpson Gulch SW	-----
Simpson Gulch SE	770196, 820768
Shute Creek Lake	770202, 780518, 791874, 800062, 800925, 810158, 810709, 811235, 811497, 812244, 812425, 820556, 820835
Fontenelle	770202, 780697, 780918, 790278, 800269, 800388, 800538, 800924, 801286, 801386, 810567, 811235, 811343, 811497, 812388, 820088, 820333, 820796
McCullen Bluff	770190, 780918, 790585, 800269
Thoman School	-----
Gasson Bridge	801870
Pittman Well	801870, 820274, 820768
Cow Hollow Creek	780182, 780519, 780918, 790352, 790353, 790573, 790889, 790927, 790937, 790939, 800575, 811311, 811652, 820511, 820662
Fontenelle SE	780182, 780918, 790058, 790879, 790927, 790937, 800575, 800913, 800981, 811145, 811345, 811540
Whiskey Buttes	780918
Lombard Buttes	800414, 810567
Big Island Bridge	-----
Chrisman Ranch	-----
Church Butte NW	790242, 790355, 790370, 801054, 811240, 811314, 820662
Moxa	780918, 780942, 790053, 790055, 790242, 790354, 790355, 790364, 790365, 790927, 790938, 791202, 791710, 800217, 800606, 800818, 810054, 801333, 801334, 810065, 810160, 811237, 811248, 811254, 811314, 811540, 820652
Sevenmile Gulch	750070, 760205, 780520, 780918, 790055, 790147, 790308, 790491, 791026, 800217, 800421, 801333, 801356, 801720, 801904, 801907, 802313, 810794, 811102, 811171, 811258, 812036, 812061, 820543, 820656
Blue Point	750070, 760205, 790471, 800339, 800414, 801356, 811171, 820543

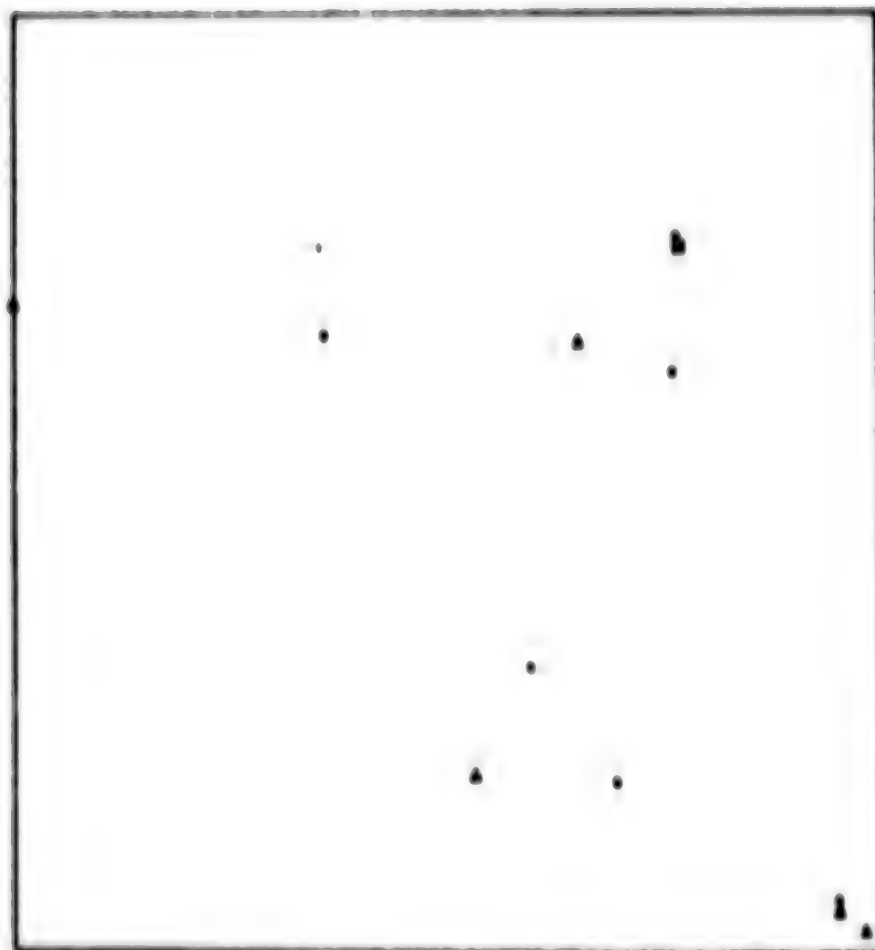
USGS 7.5' Quadrangle Map Wyoming SHPO's Survey Report Numbers

Stevens Flat	791052, 791425, 800339, 800414, 801690, 810066
Austin Ranch	-----
Church Butte	790371
Verne	780918, 790291, 790357, 790371, 790466, 791532, 791927, 800384, 800931, 801334, 810822, 811344, 820554
Granger	790357, 790745, 791026, 801875, 810822, 811344, 820231, 820345
Little America	760205, 770189, 790967, 791052, 791425, 800215, 800704, 820543
Bryan	770189, 770193, 790967, 791052
Peru	820744

BLANK PAGE

APPENDIX XVI
Sample Unit Artifact Distribution Maps

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



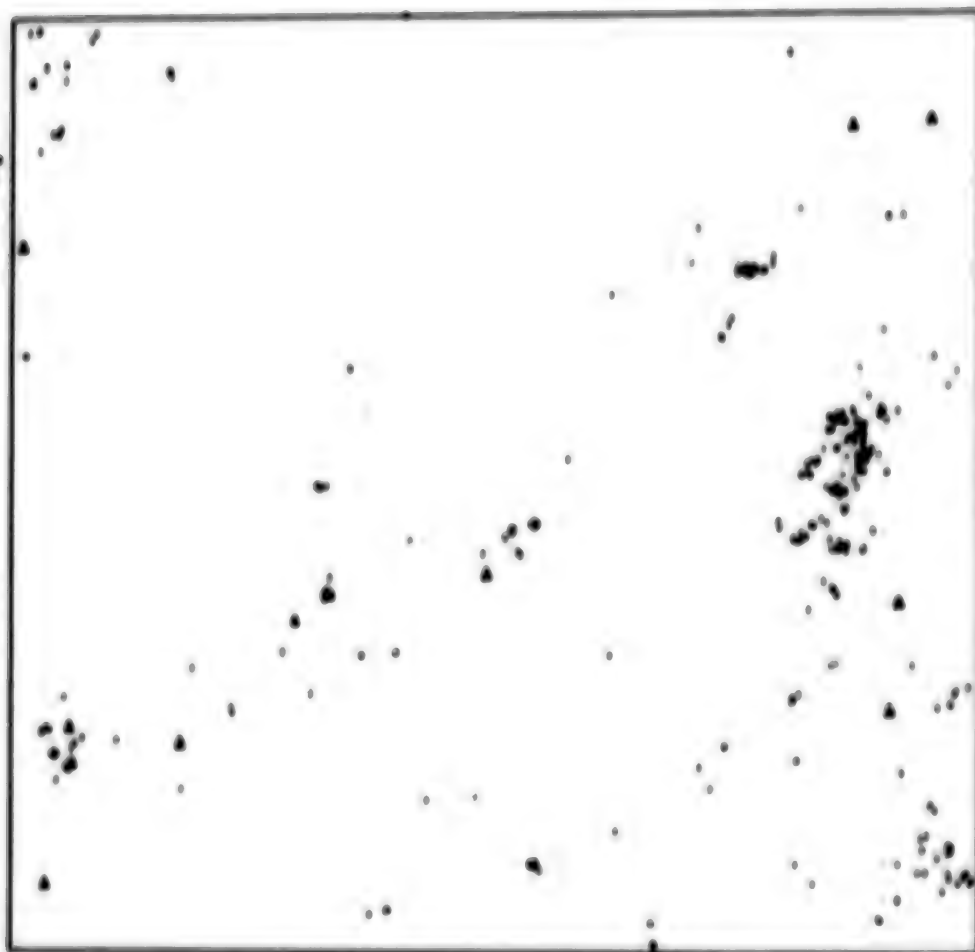
UNIT 1

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



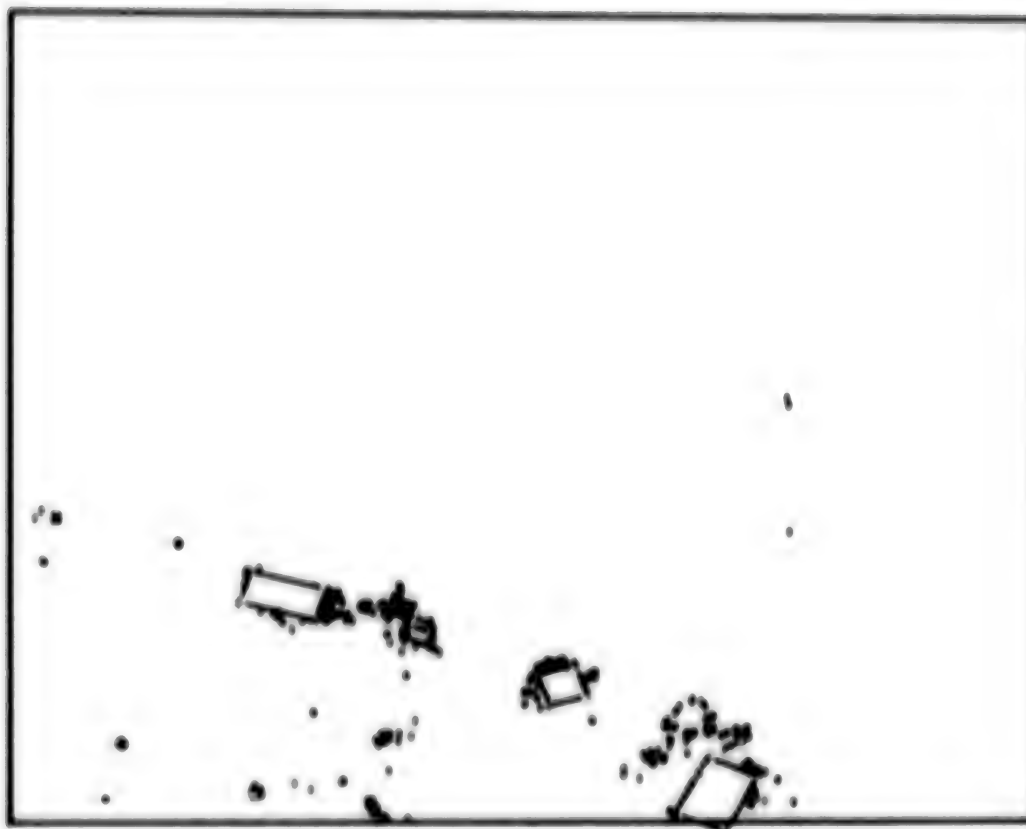
UNIT 2

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



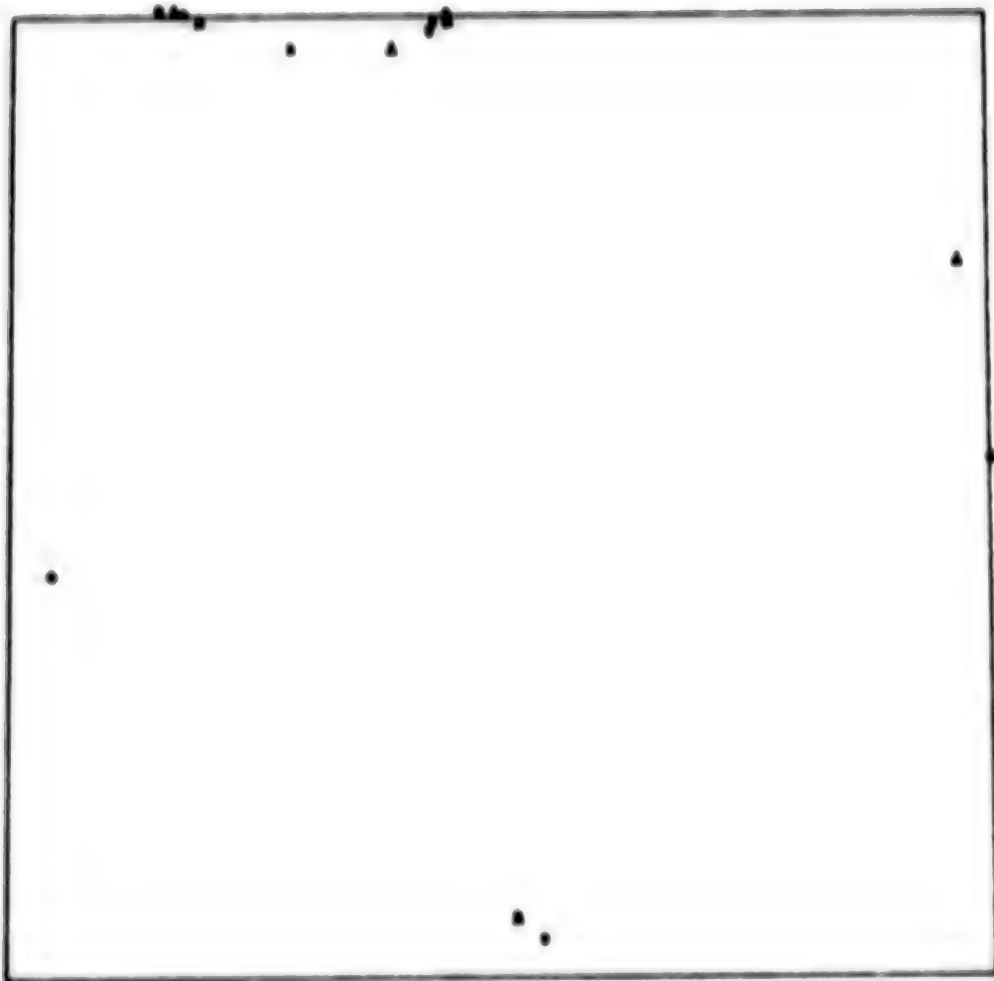
UNIT 3

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



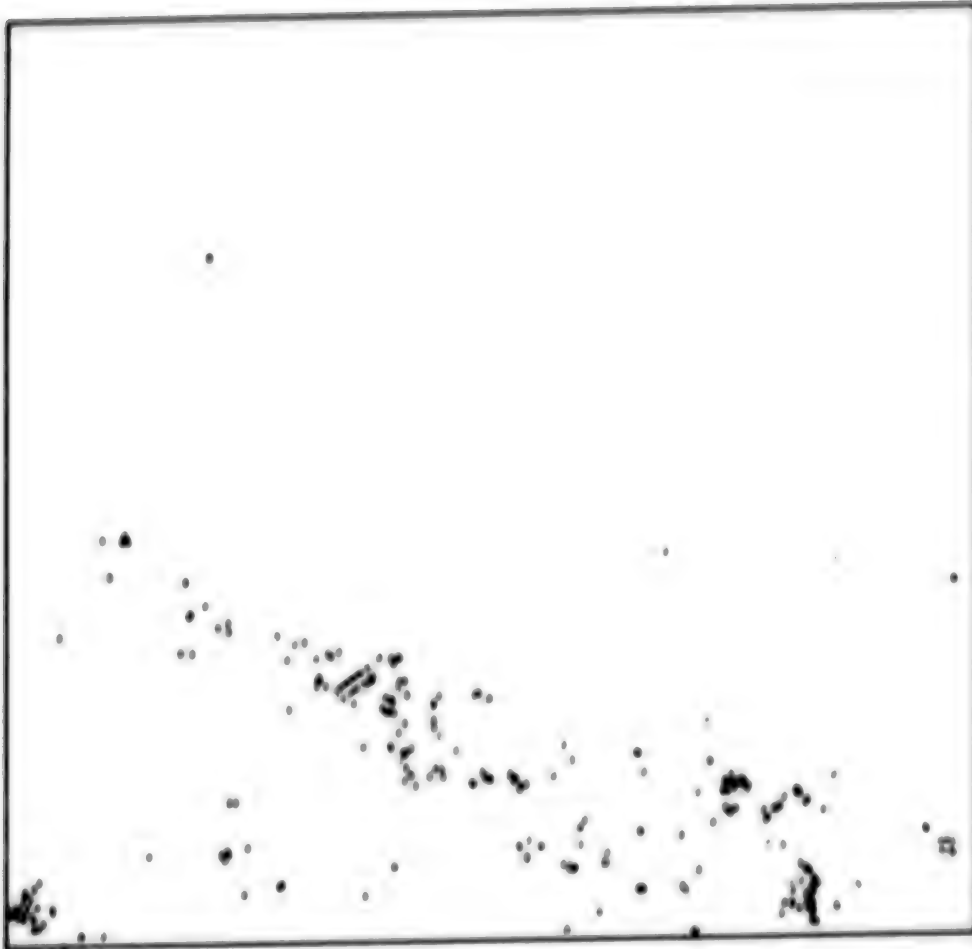
UNIT 4

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



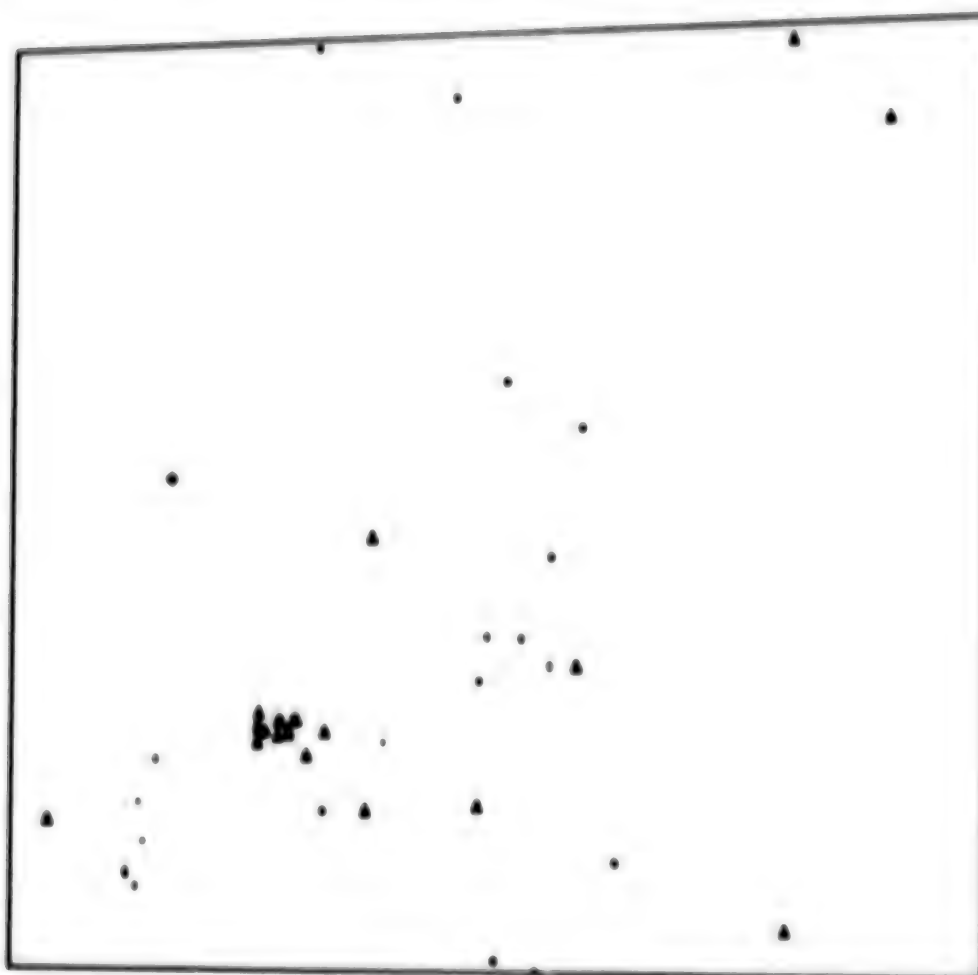
UNIT 5

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



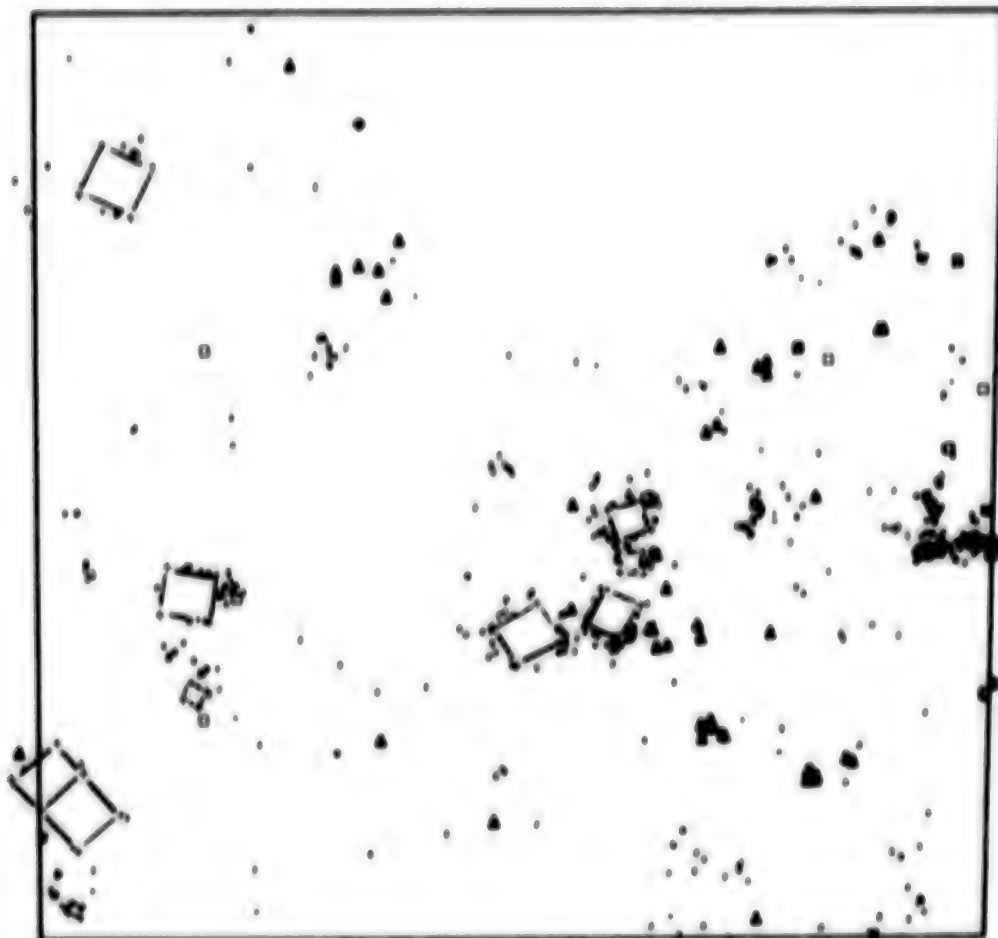
UNIT 6

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



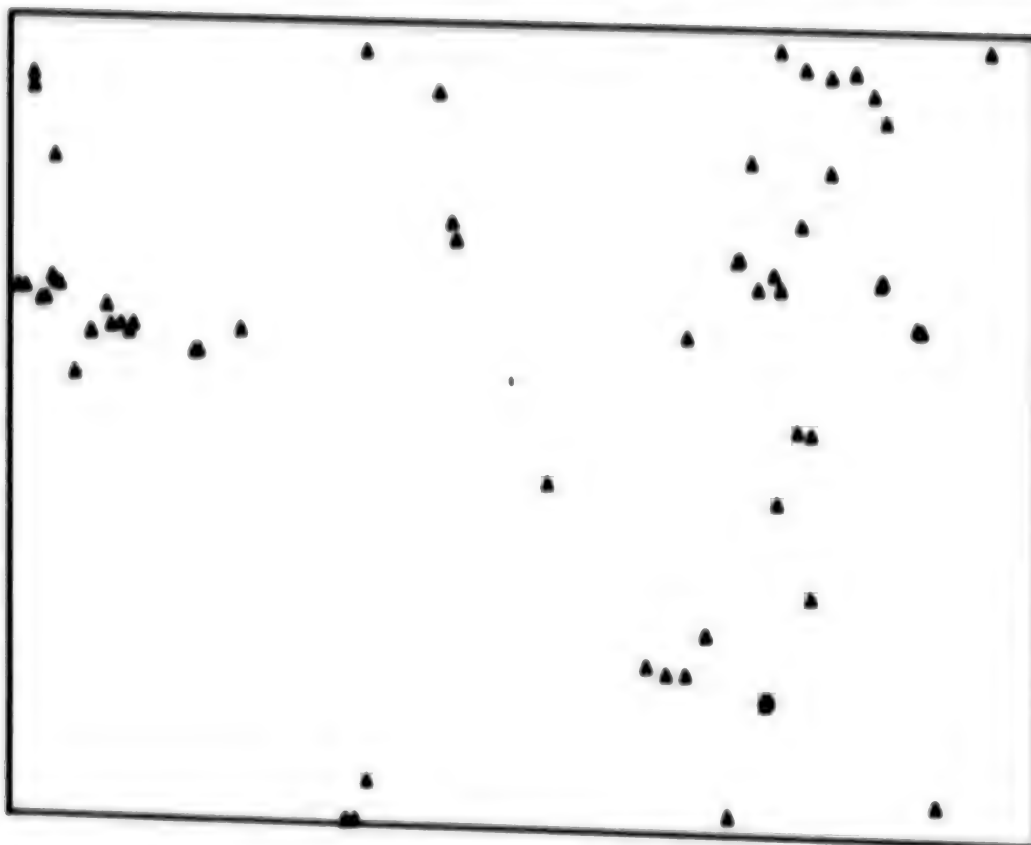
UNIT 7

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



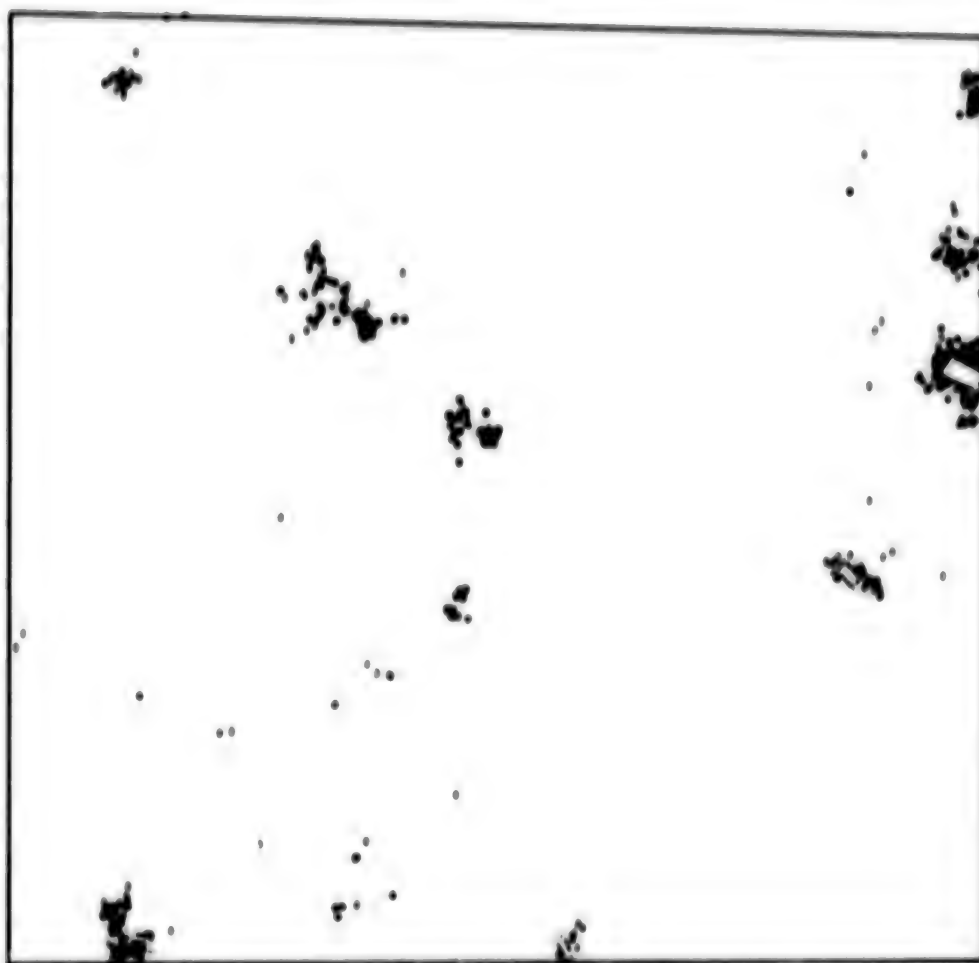
UNIT 8

SEEDSLADEE CULTURAL RESOURCES ASSESSMENT PROJECT



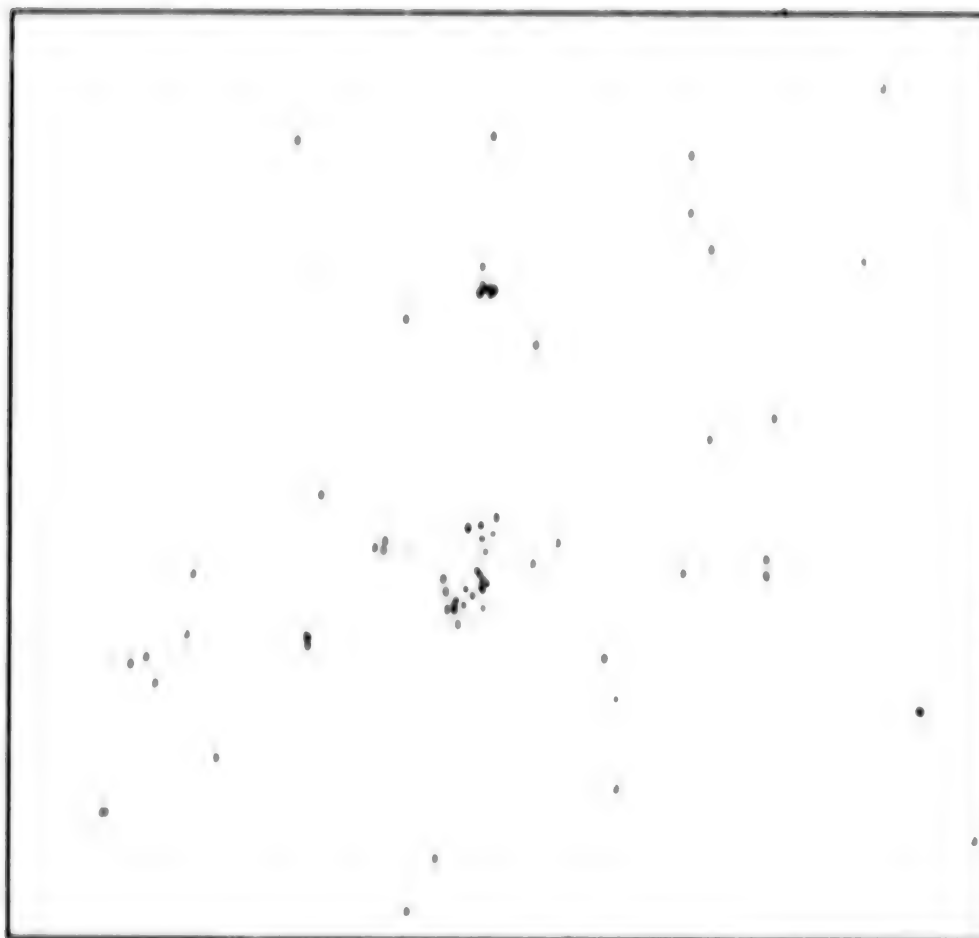
UNIT 9

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



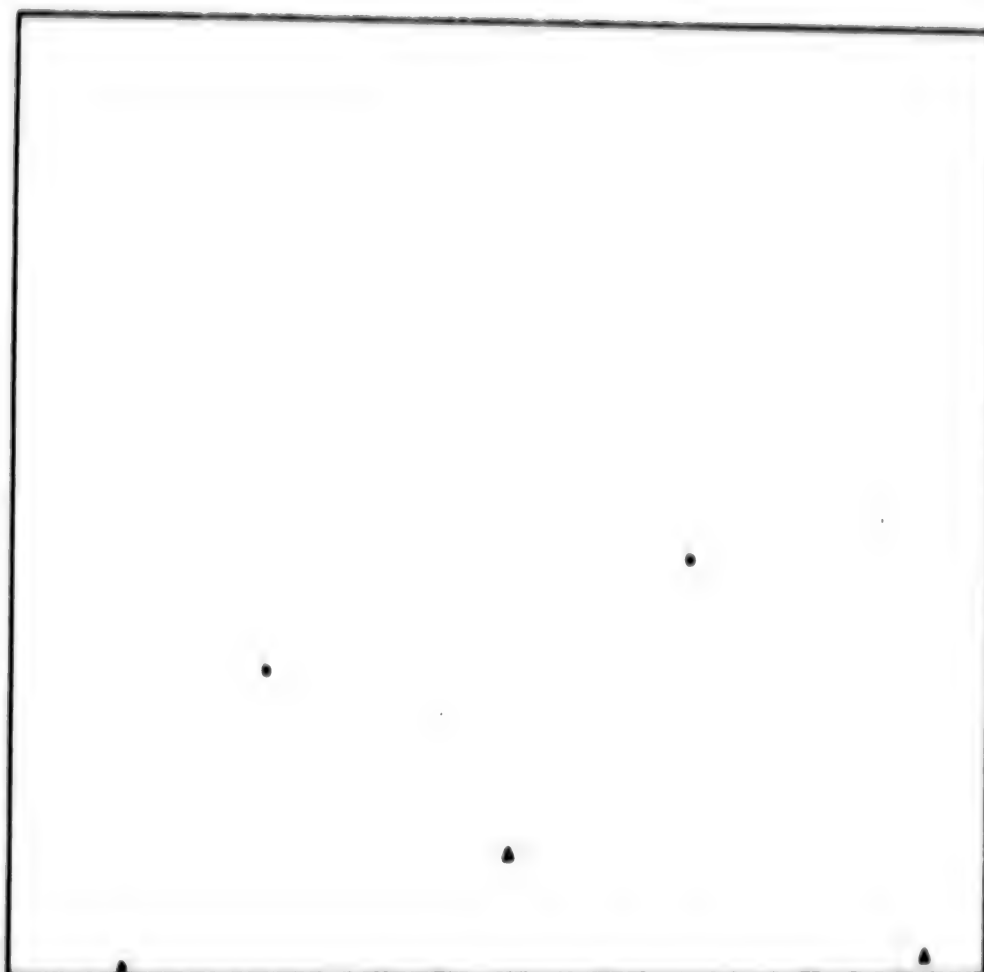
UNIT 10

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



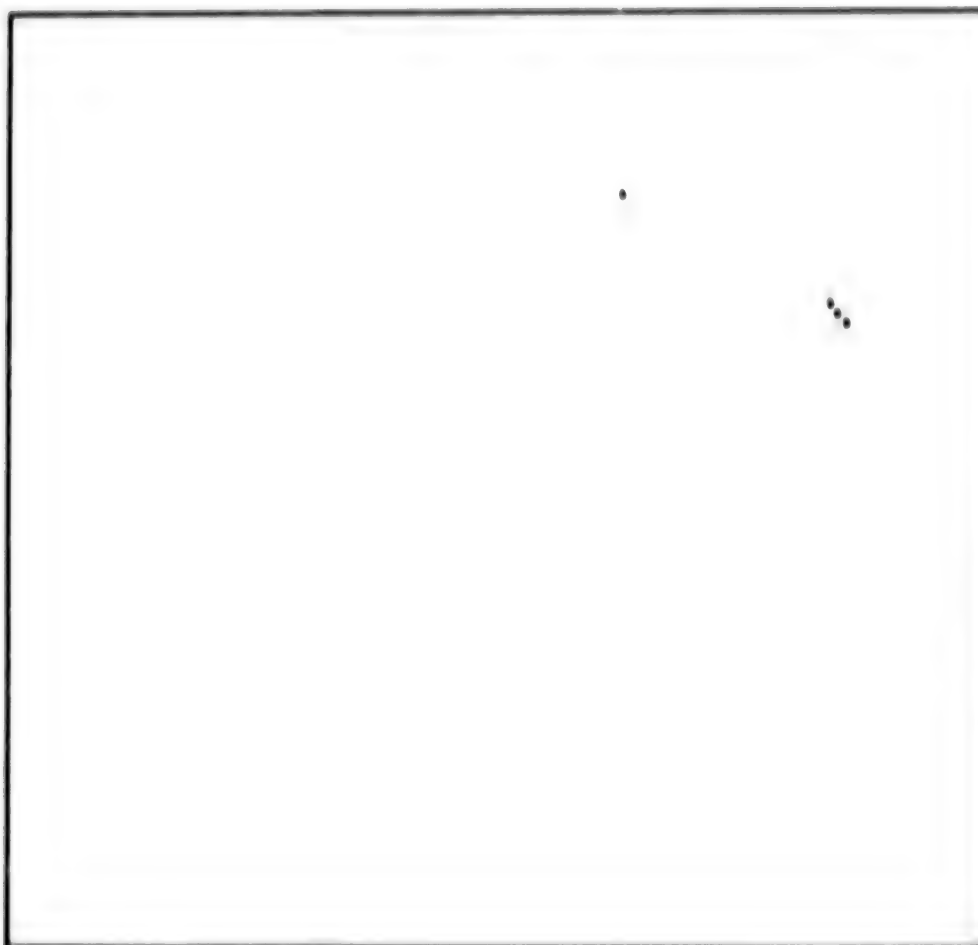
UNIT 12

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



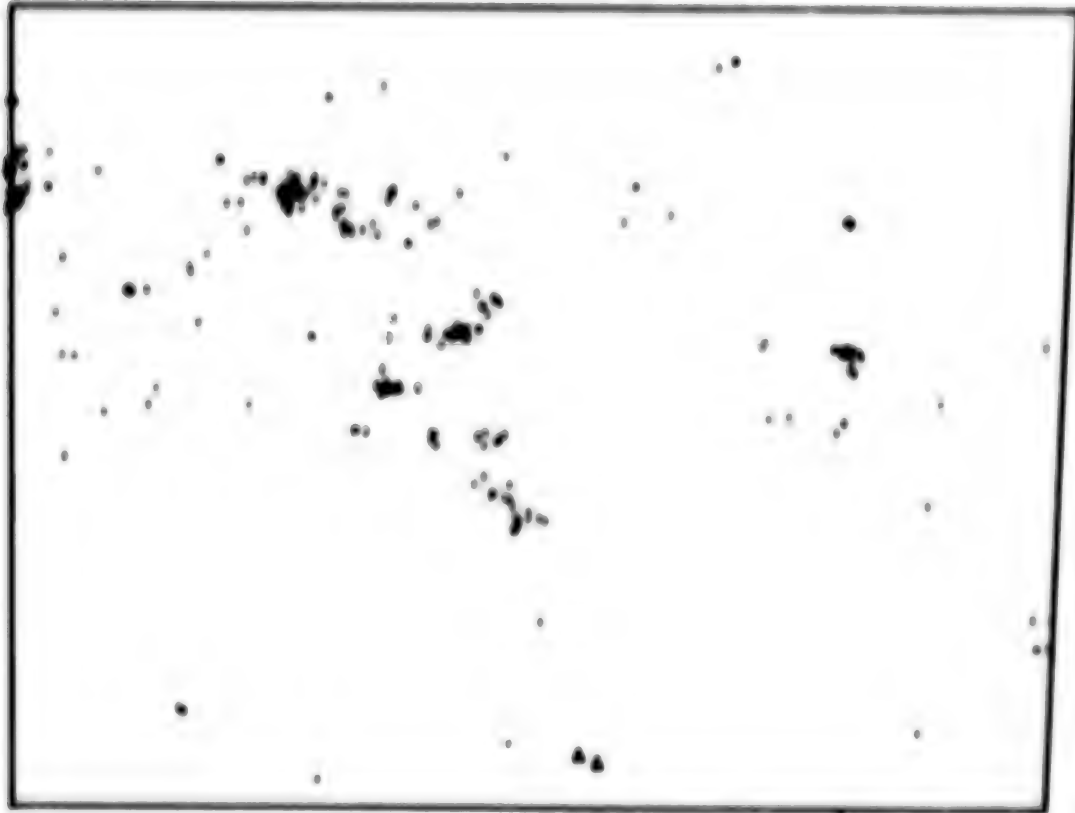
UNIT 13

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



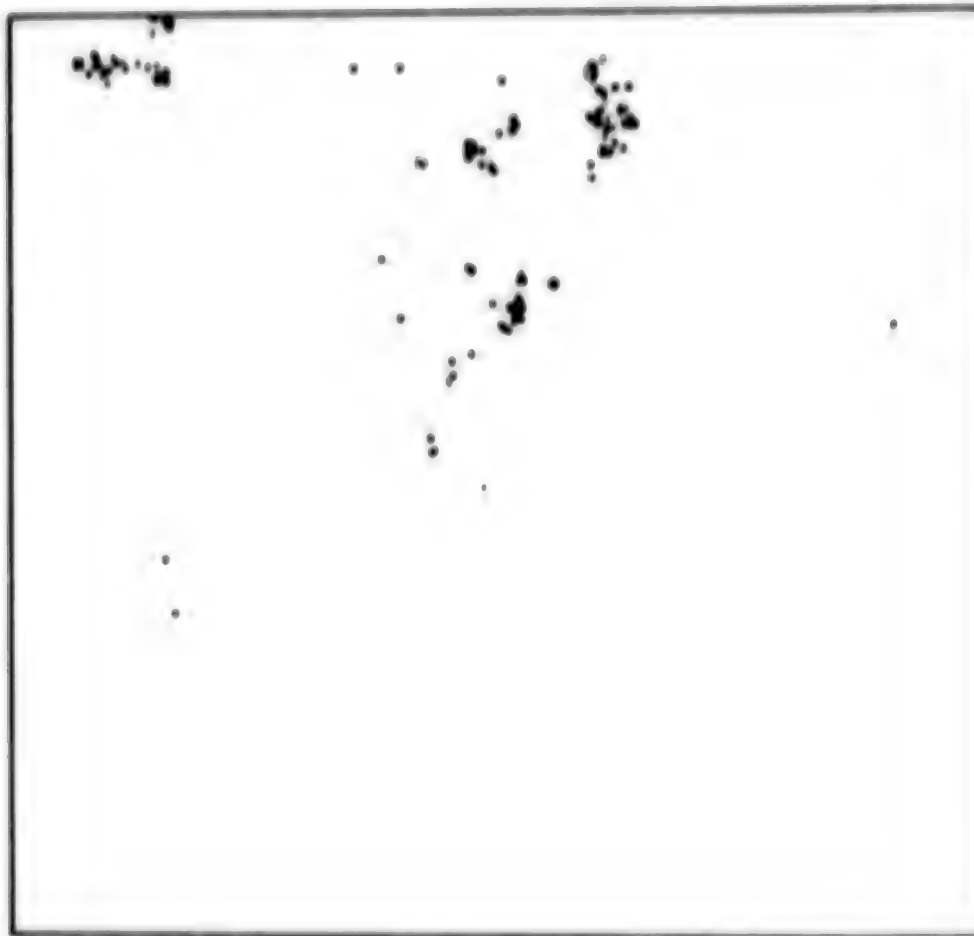
UNIT 14

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



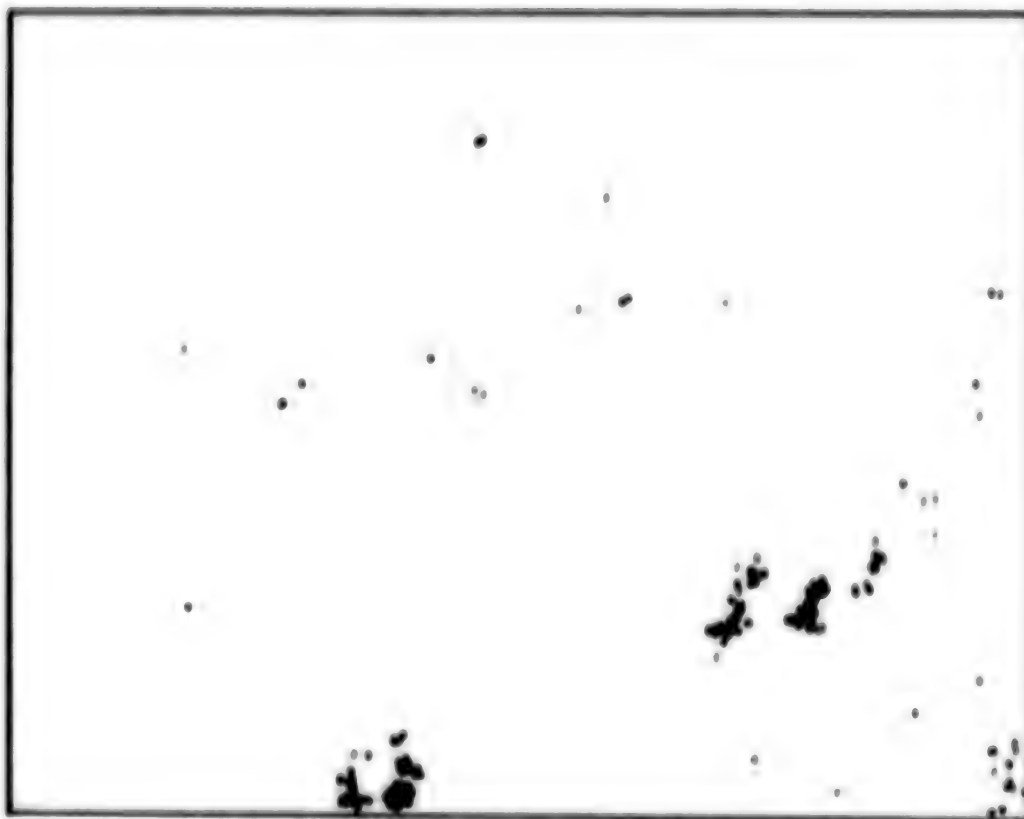
UNIT 15

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



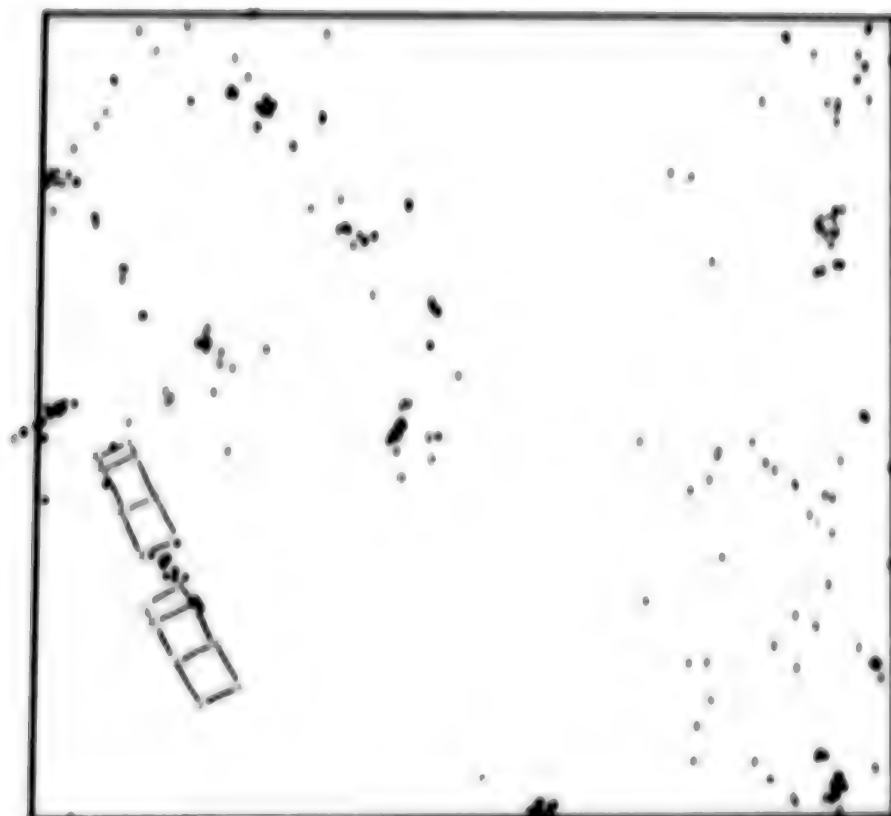
UNIT 16

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



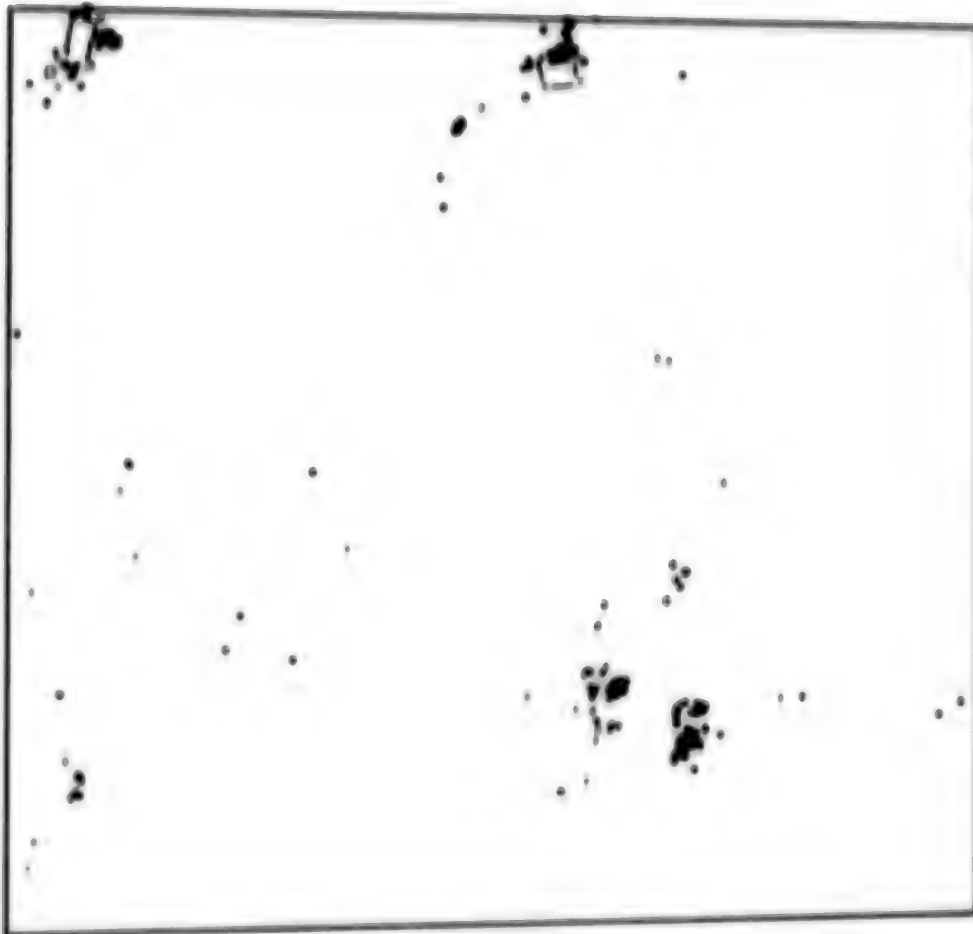
UNIT 17

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



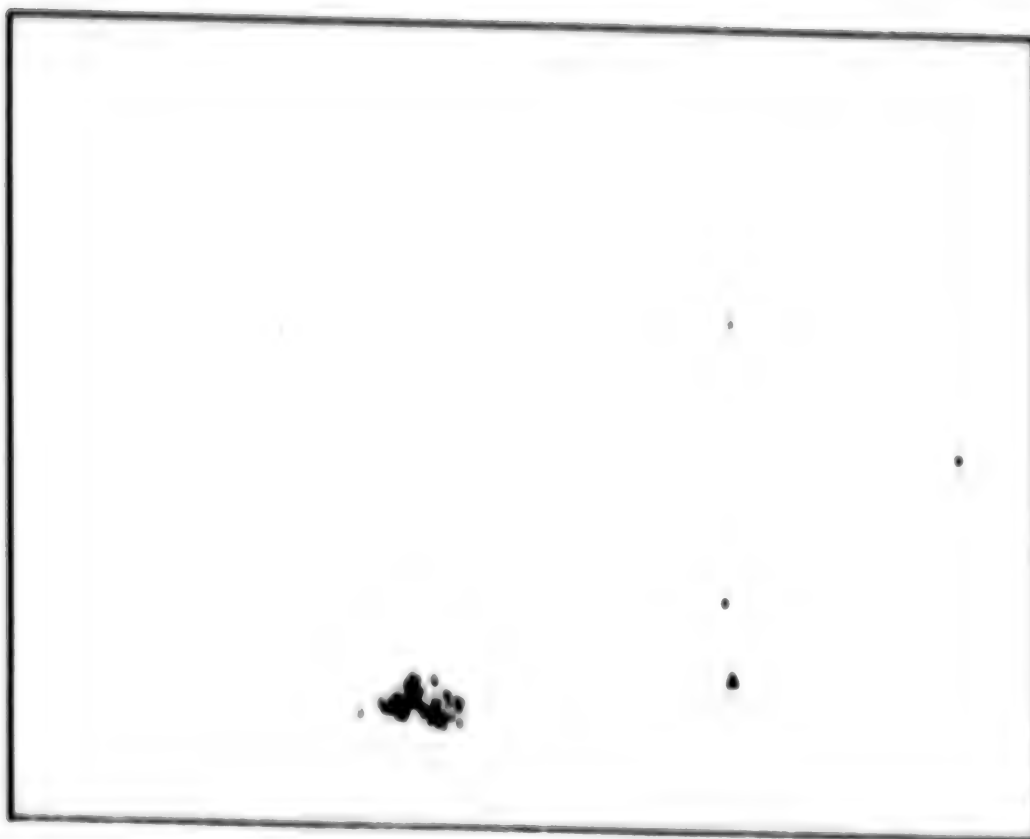
UNIT 19

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



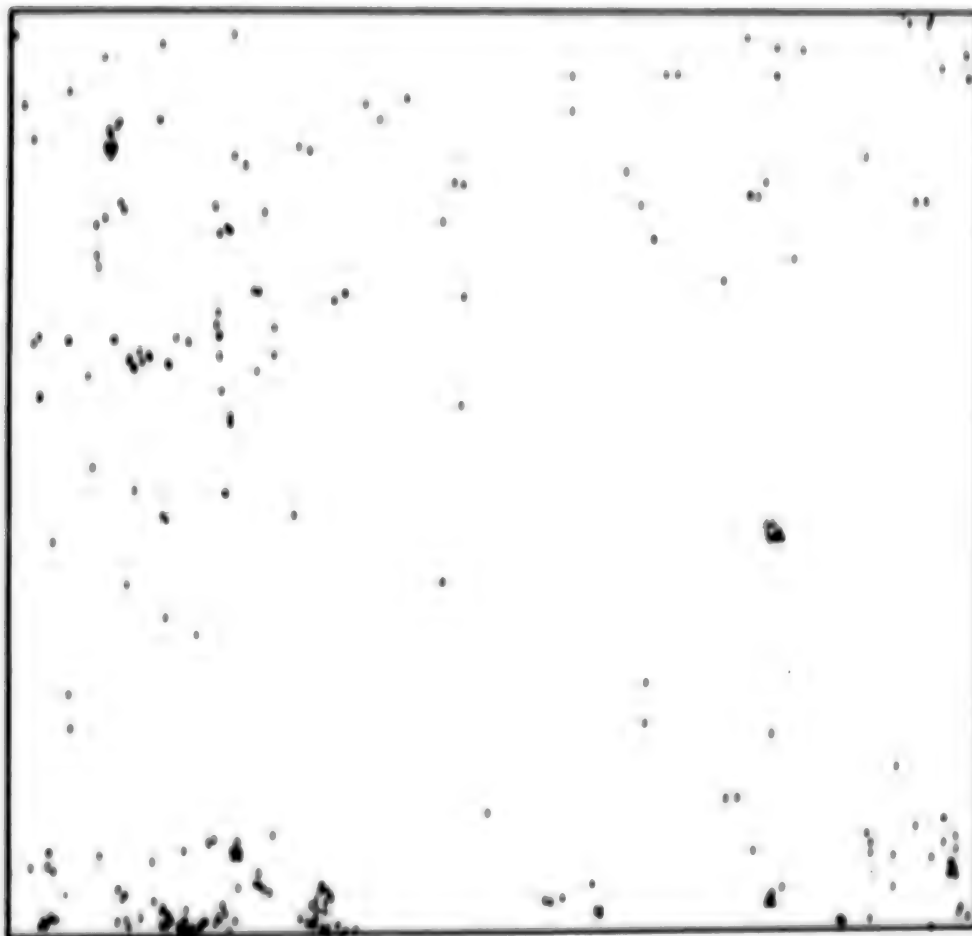
UNIT 20

SEEDSTADDEE CULTURAL RESOURCES ASSESSMENT PROJECT



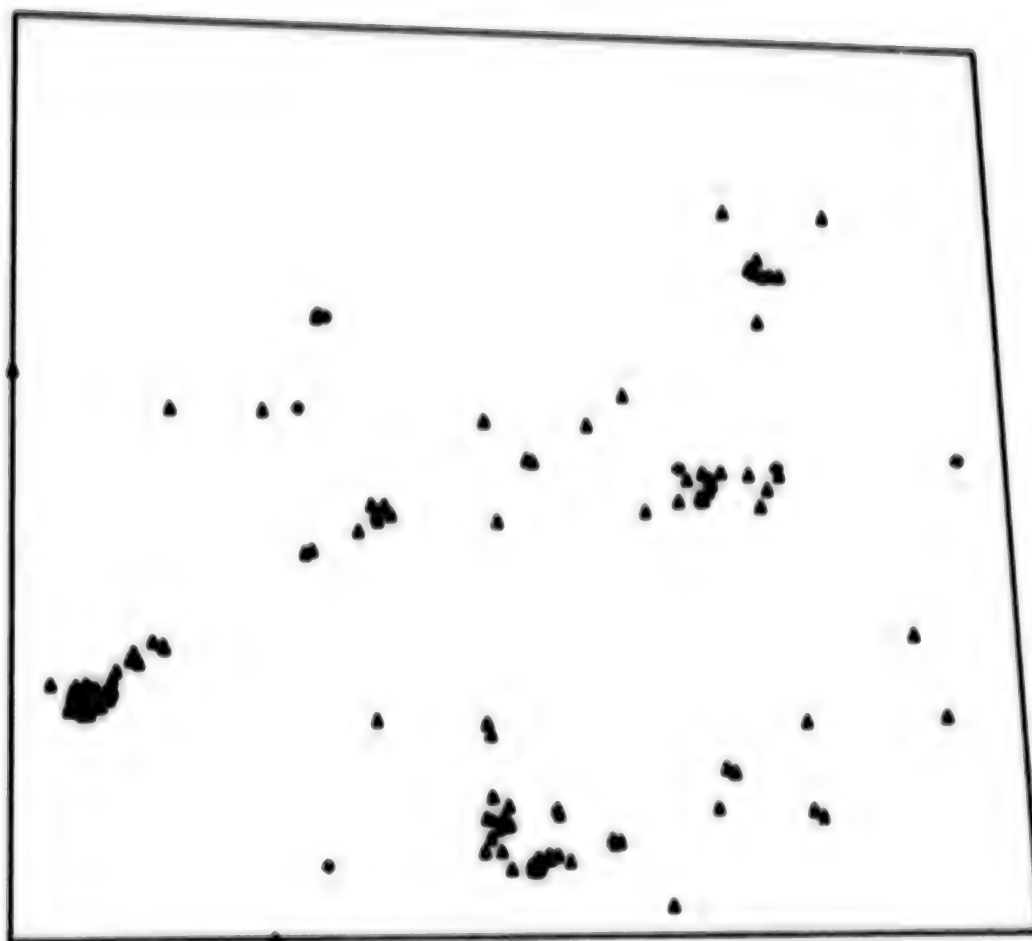
UNIT 21

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



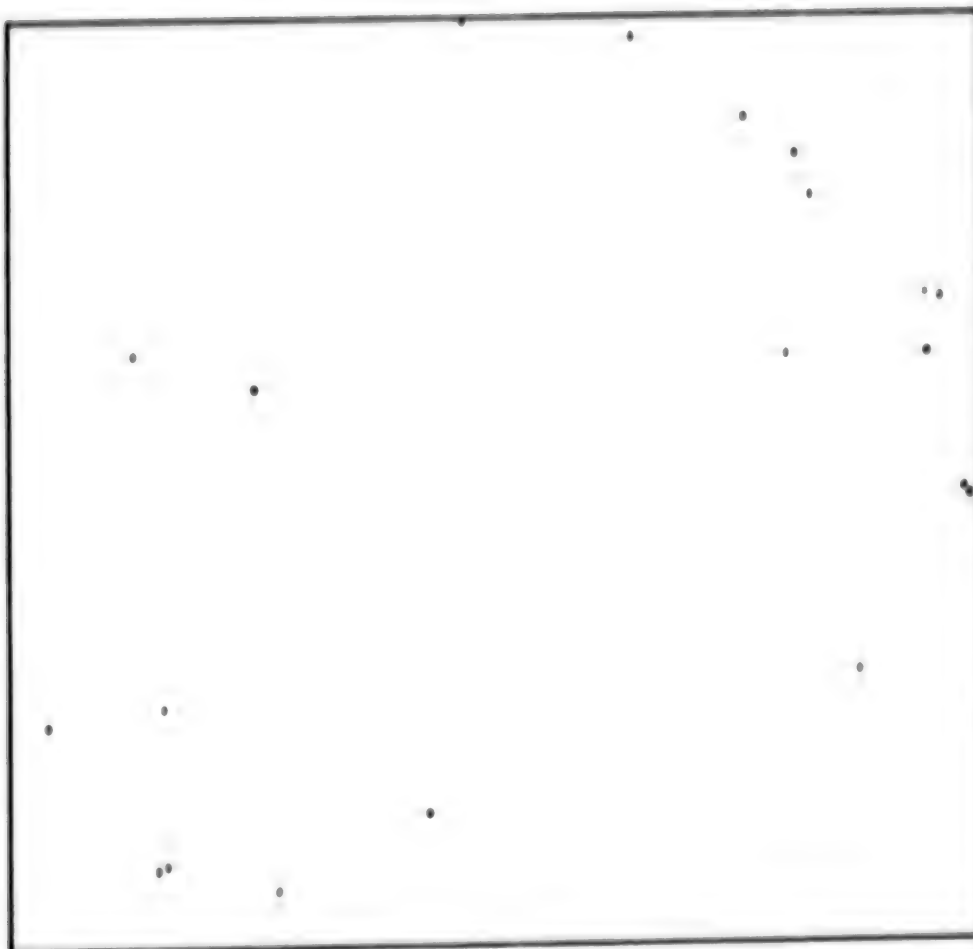
UNIT 22

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



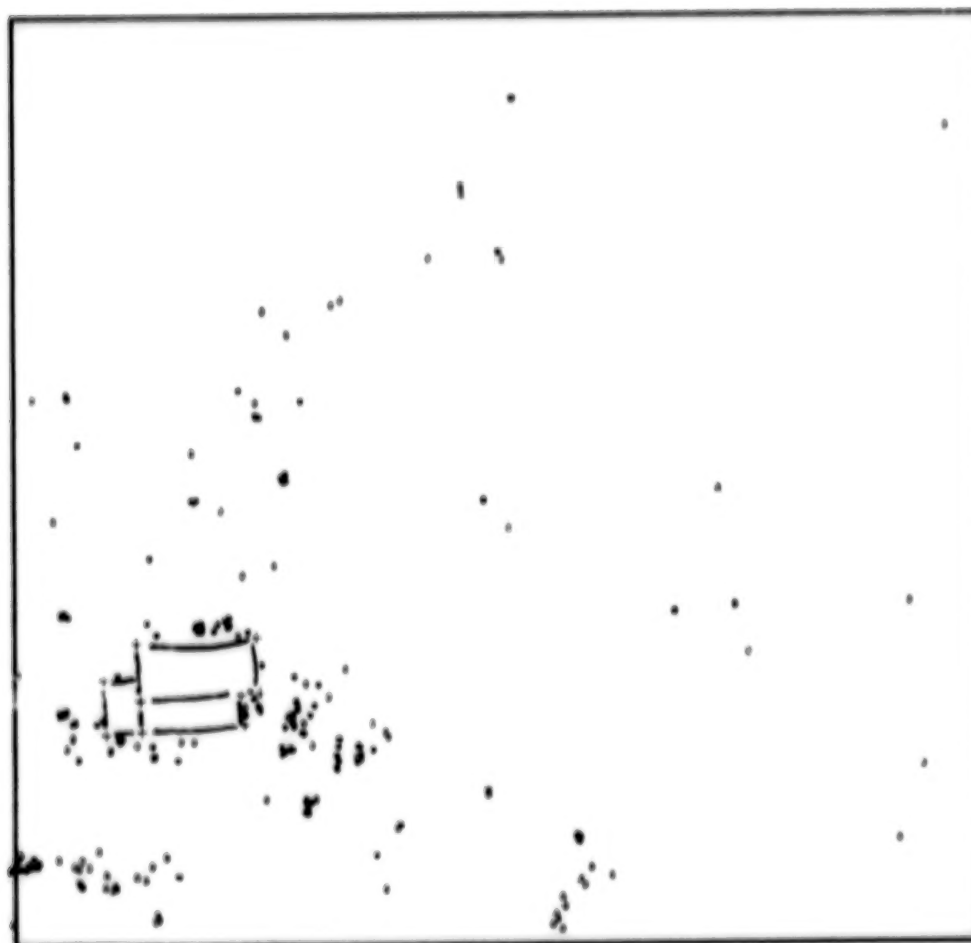
UNIT 23

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



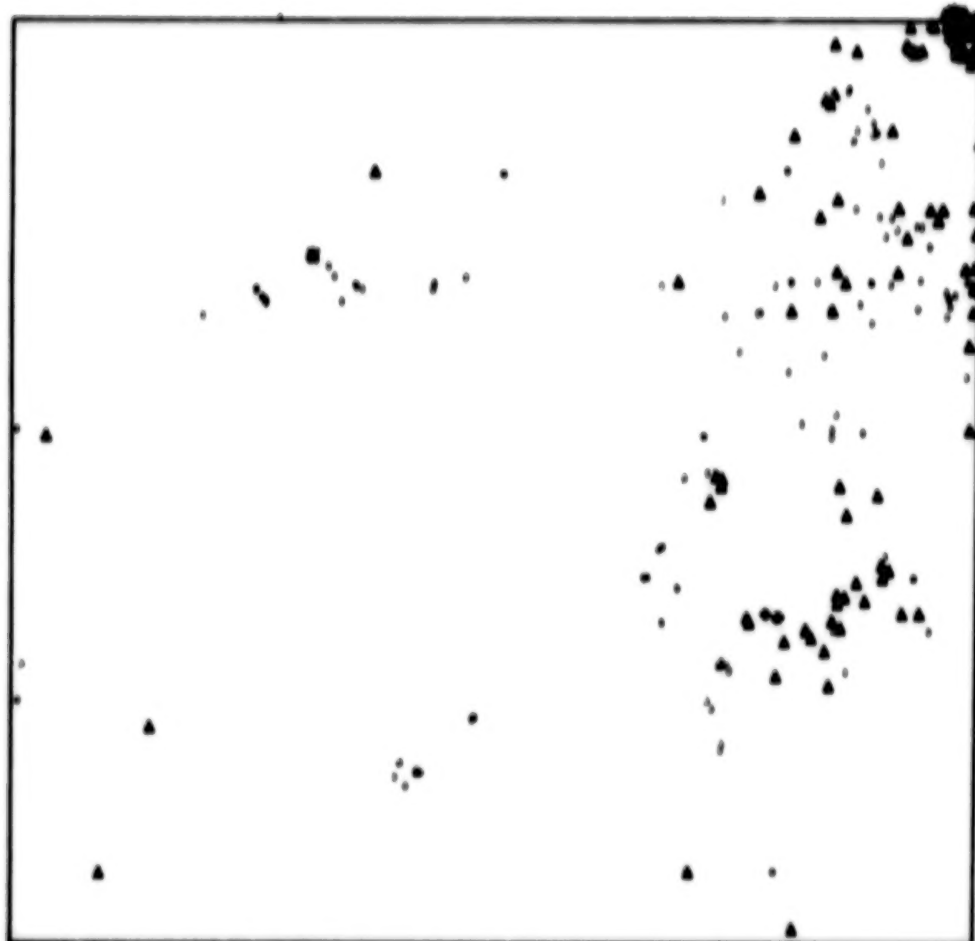
UNIT 24

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



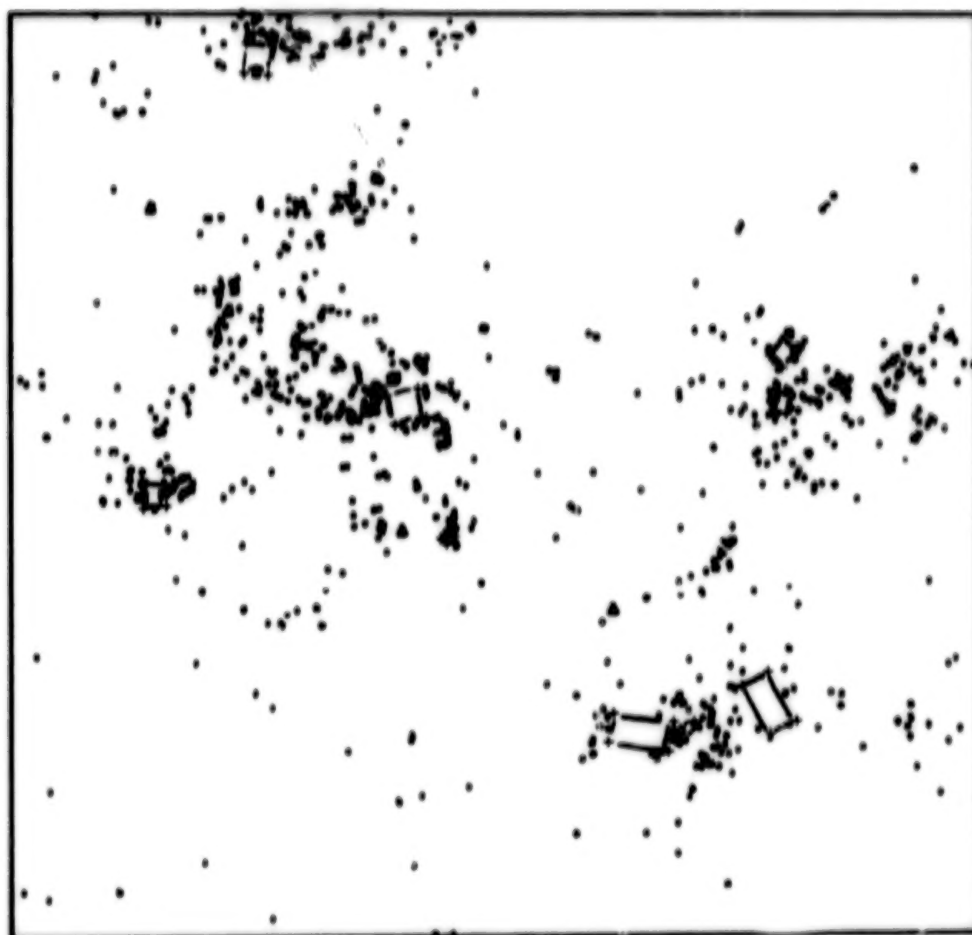
UNIT 25

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



UNIT 26

SEEDSKADEE CULTURAL RESOURCES ASSESSMENT PROJECT



UNIT 28

